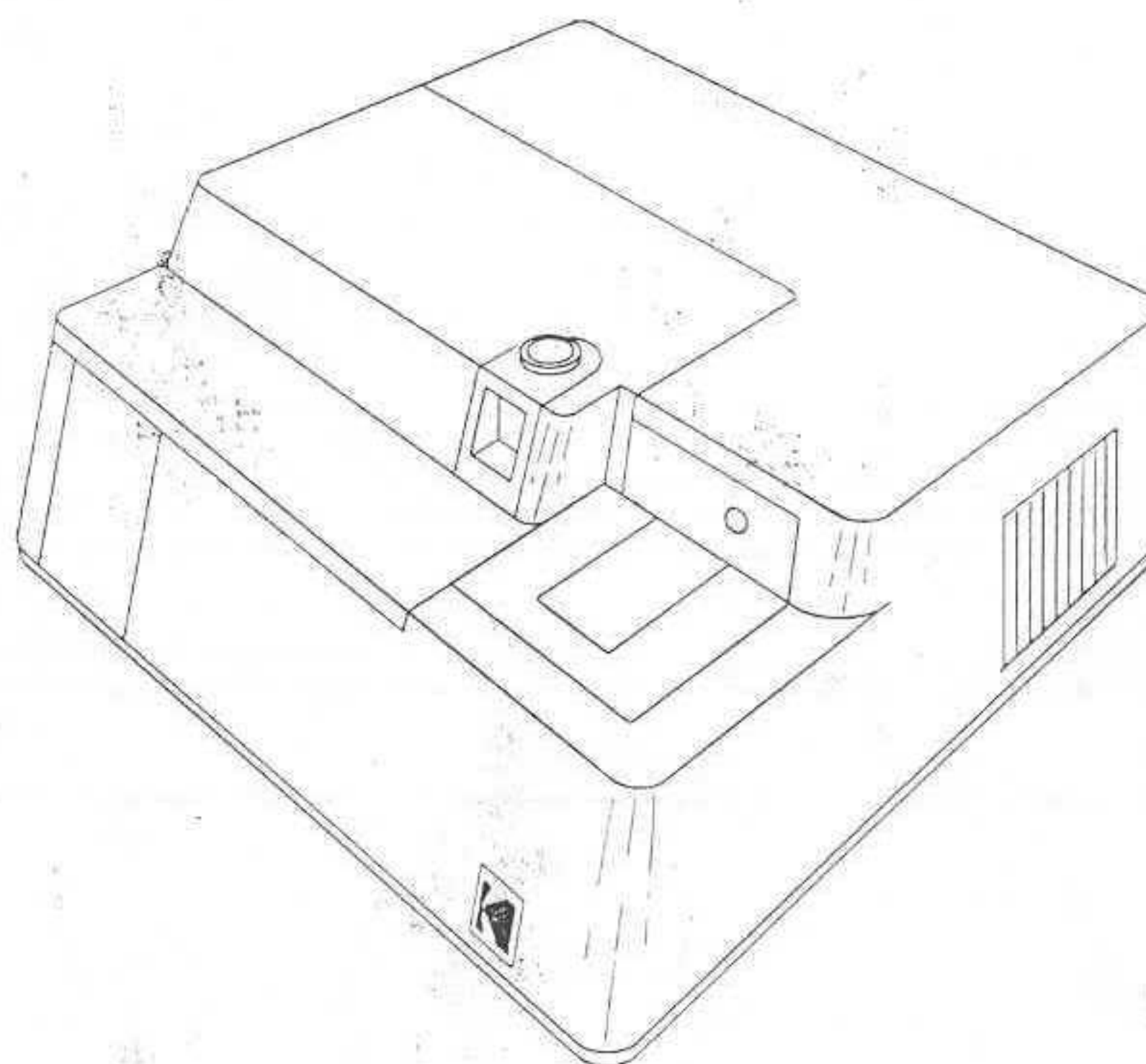




Publication No. XP3111-13
3/86

Service Publication for the Kodak Ektachem DTSC MODULE



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.....
· CAUTION ·
.....



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

Contents of the Service Publication

	<u>Publication No.</u>		<u>Publication No.</u>
Section 1. General Information	XP3111-1	Section 7. CANCELLED.	
Contents		For site specifications, see the service	
Special Tools		publication for the Kodak Ektachem DT60 ANALYZER	
Labels			
Section 2. Normal Operation	XP3111-2	Section 8. CANCELLED.	
Slide Transport System		For installation instructions, see the service	
Slide Identification System		publication for the Kodak Ektachem DT60 ANALYZER	
Slide Spotting System			
HALL EFFECT BOARD			
Section 3. CANCELLED.		Section 9. Special Procedures	XP3111-9
For information on options, see the service		Correction Factors	
publication for the Kodak Ektachem DT60 ANALYZER		DR Procedures	
		Computer Interface	
Section 4. Diagnostics	XP3111-4	Section 10. Parts/Removals	XP3111-10
Diagnosing and Repairing Malfunctions			
Error Code Tables		Section 11. CANCELLED.	
Error Conditions		For the glossary, see the service	
Checkout Procedures		publication for the Kodak Ektachem DT60 ANALYZER	
Section 5. Diagrams	XP3111-5	Section 12. CANCELLED.	
		For modifications, see the service	
Section 6. Adjustments	XP3111-6	publication for the Kodak Ektachem DT60 ANALYZER	
FLASH LAMP - Illumination			
SLIDE TRANSPORT BELT - Tension		Section 13. Newsletters	
SPOT DETECTOR SENSOR - Voltage			
BAR CODE READER - Voltage		Section 14. Notes	
TIP - Height			

To order a complete set of Tabs, the Title Page, and Contents page for the Service Publication, use publication no. XP3111-13.

To order the complete service publication, use PK3111.



Publication No. XP3111-1
4/86

Kodak Ektachem DTSC MODULE General Information Section 1

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Contents of the Service Publication

The service publication includes the following sections:

- General Information
- Normal Operation
- Options
- Diagrams
- Diagnostics
- Adjustments
- Site Specifications
- Installation Instructions
- Special Procedures
- Parts and Removals
- Glossary
- Modifications
- Newsletters
- Notes
- Comment Card

The parts and removals section includes adjustment specifications and installation instructions for some of the assemblies, in addition to removals, illustrated parts, and numerical and alphabetical indexes.

Configuration of the DTSC MODULE

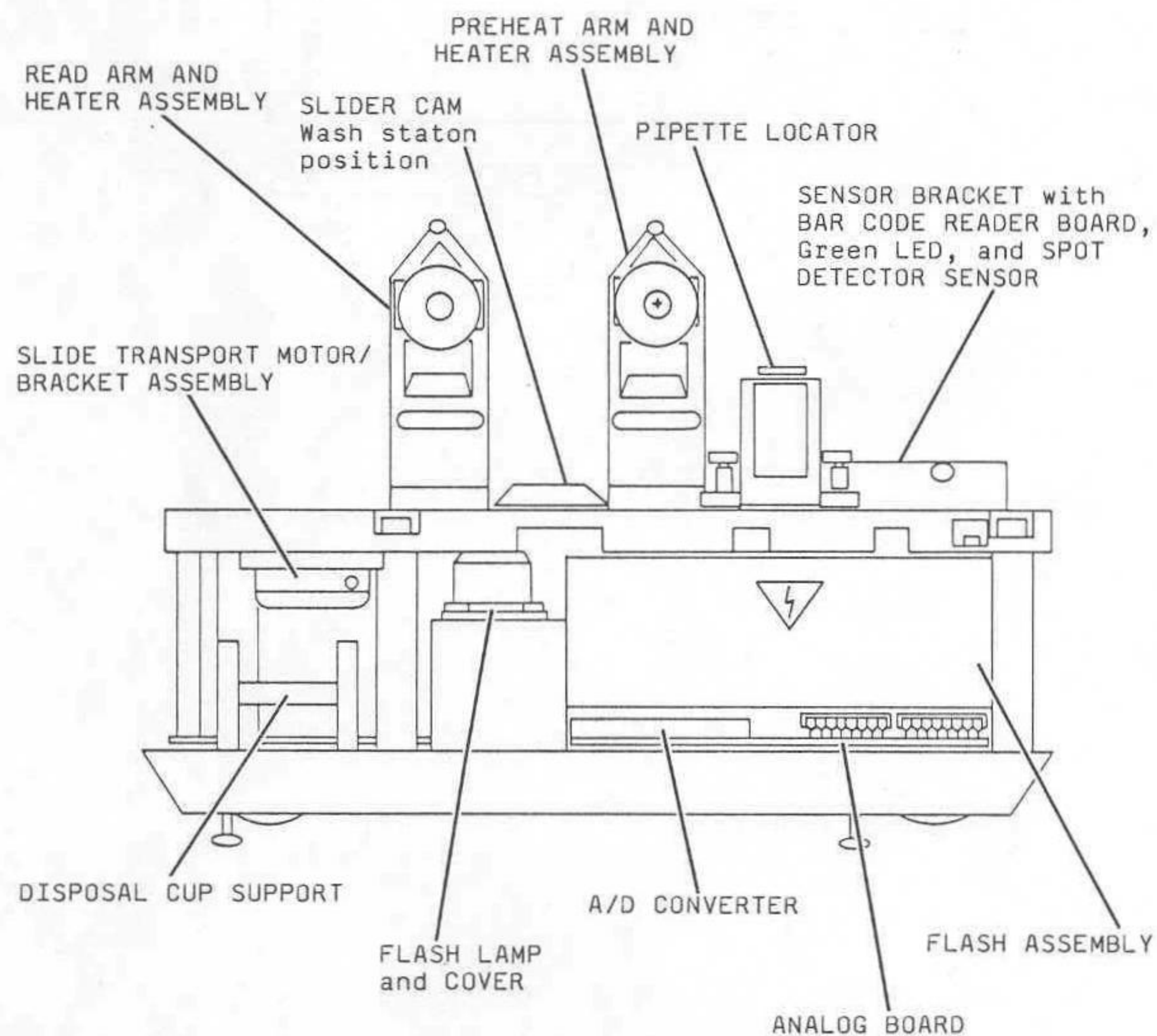


Figure 2 Front
XP3111-1, 4/86

1.3

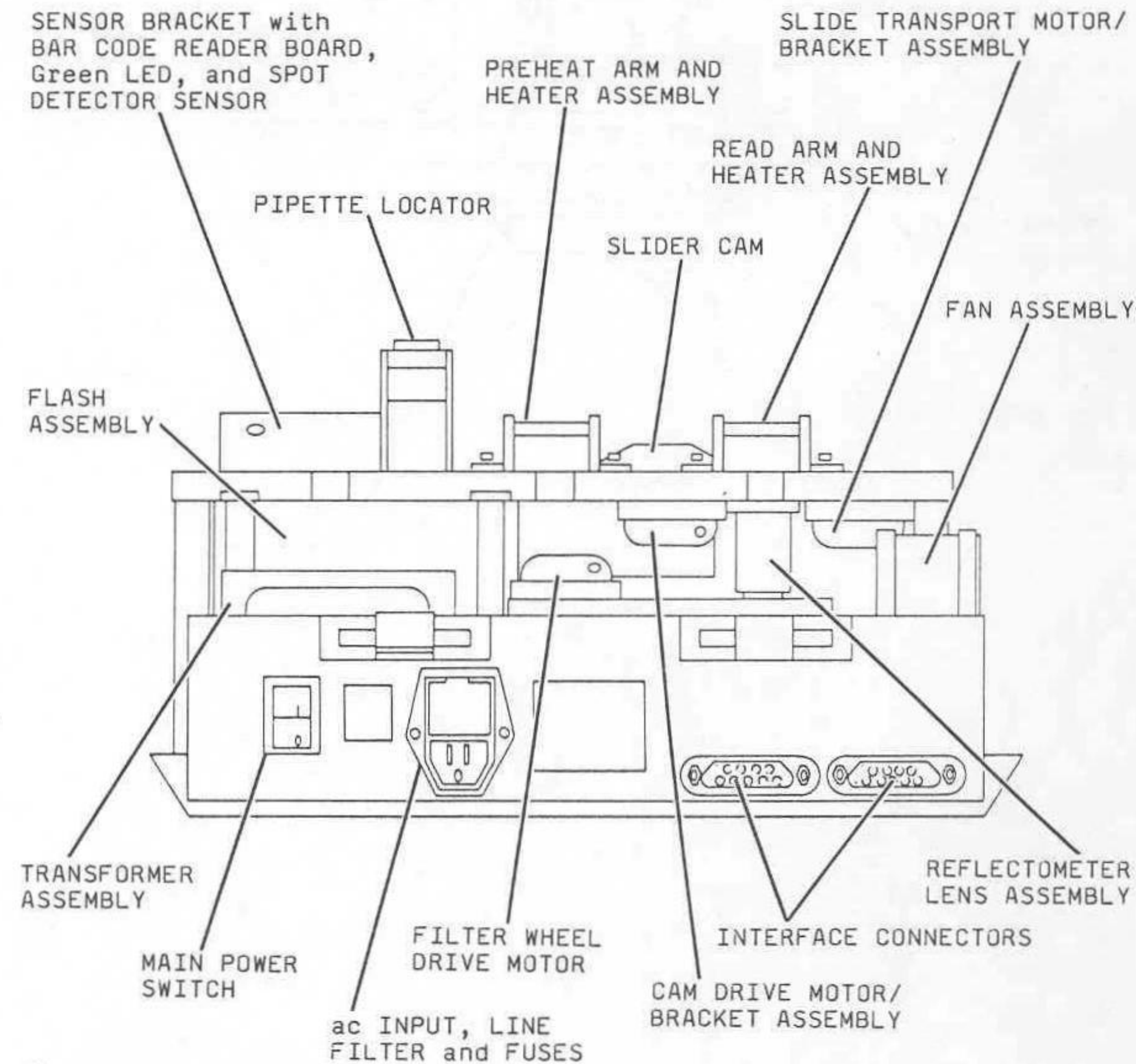


Figure 3 Back
XP3111-1, 4/86

1.4

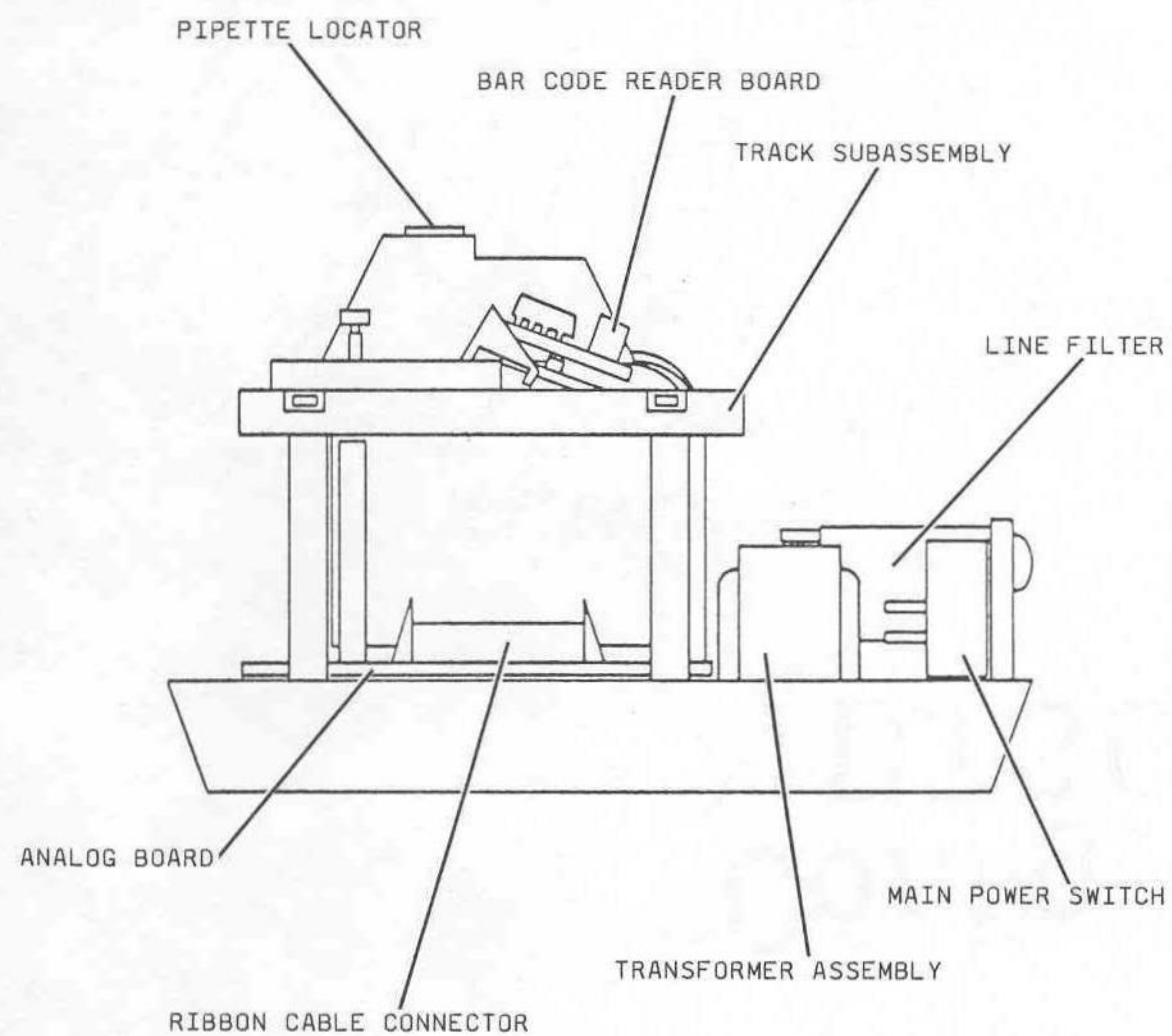


Figure 4 Right side
XP3111-1, 4/86

1.5

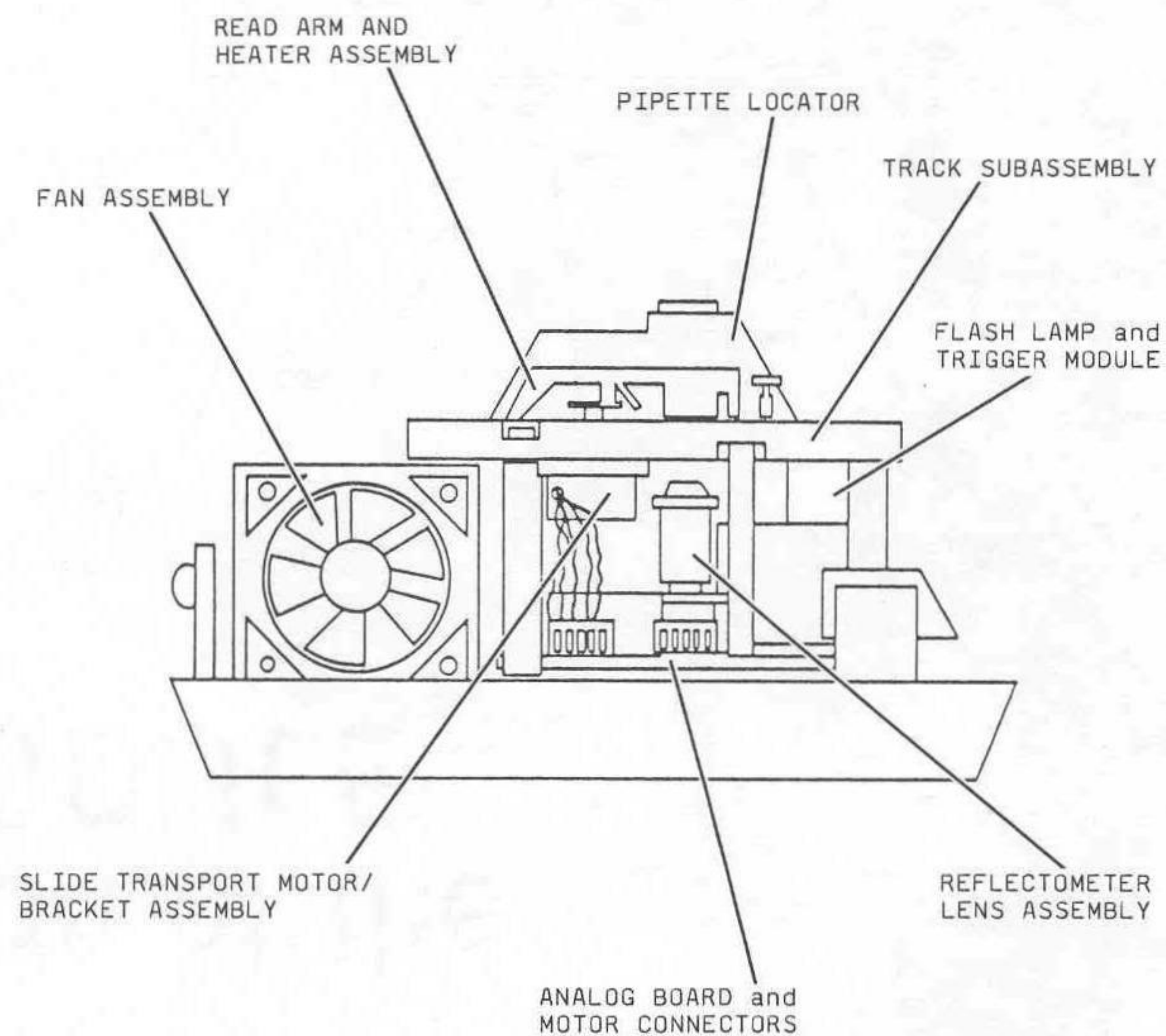


Figure 5 Left side
XP3111-1, 4/86

1.6

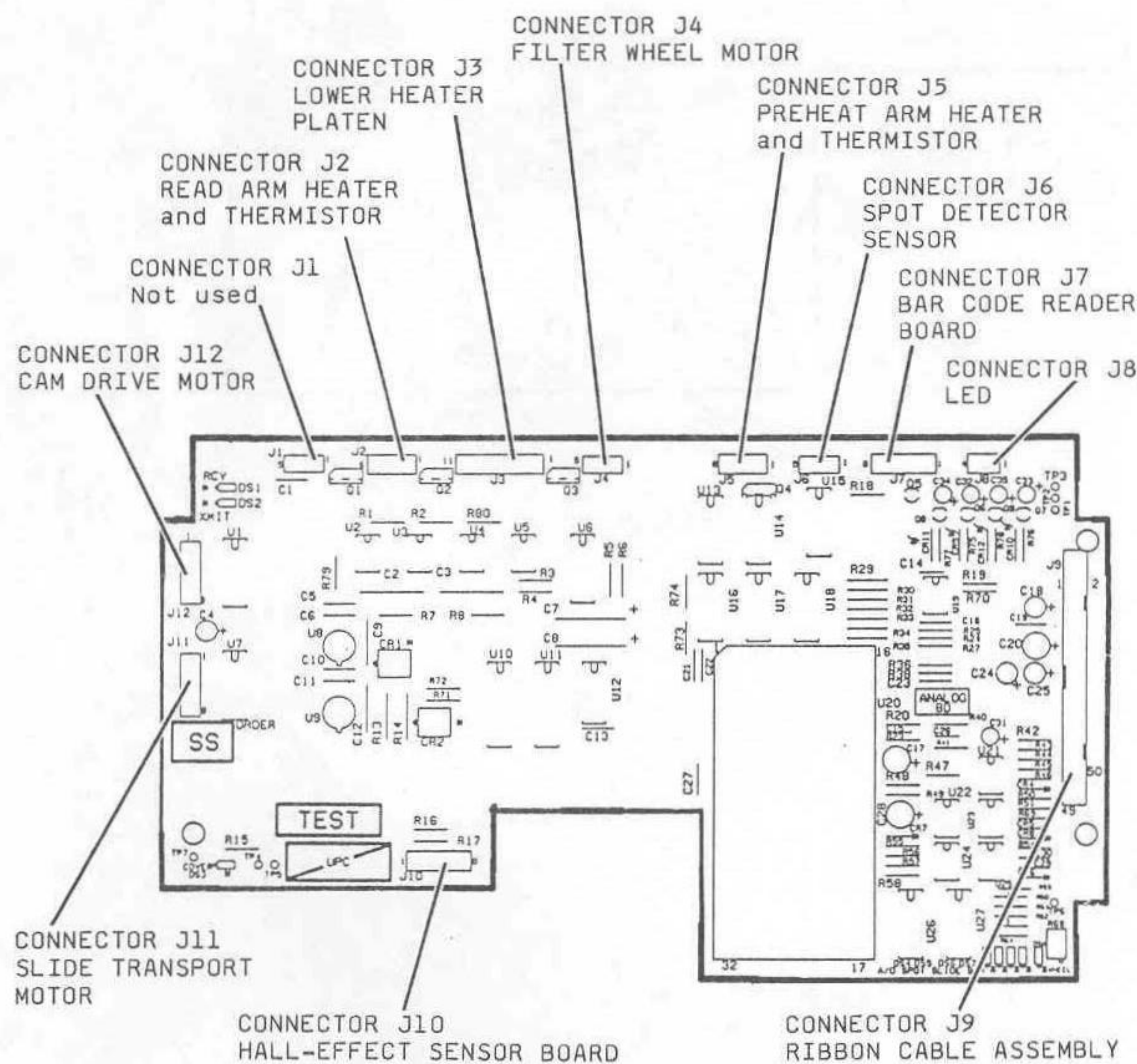


Figure 6 Position of the CONNECTORS on the ANALOG BOARD

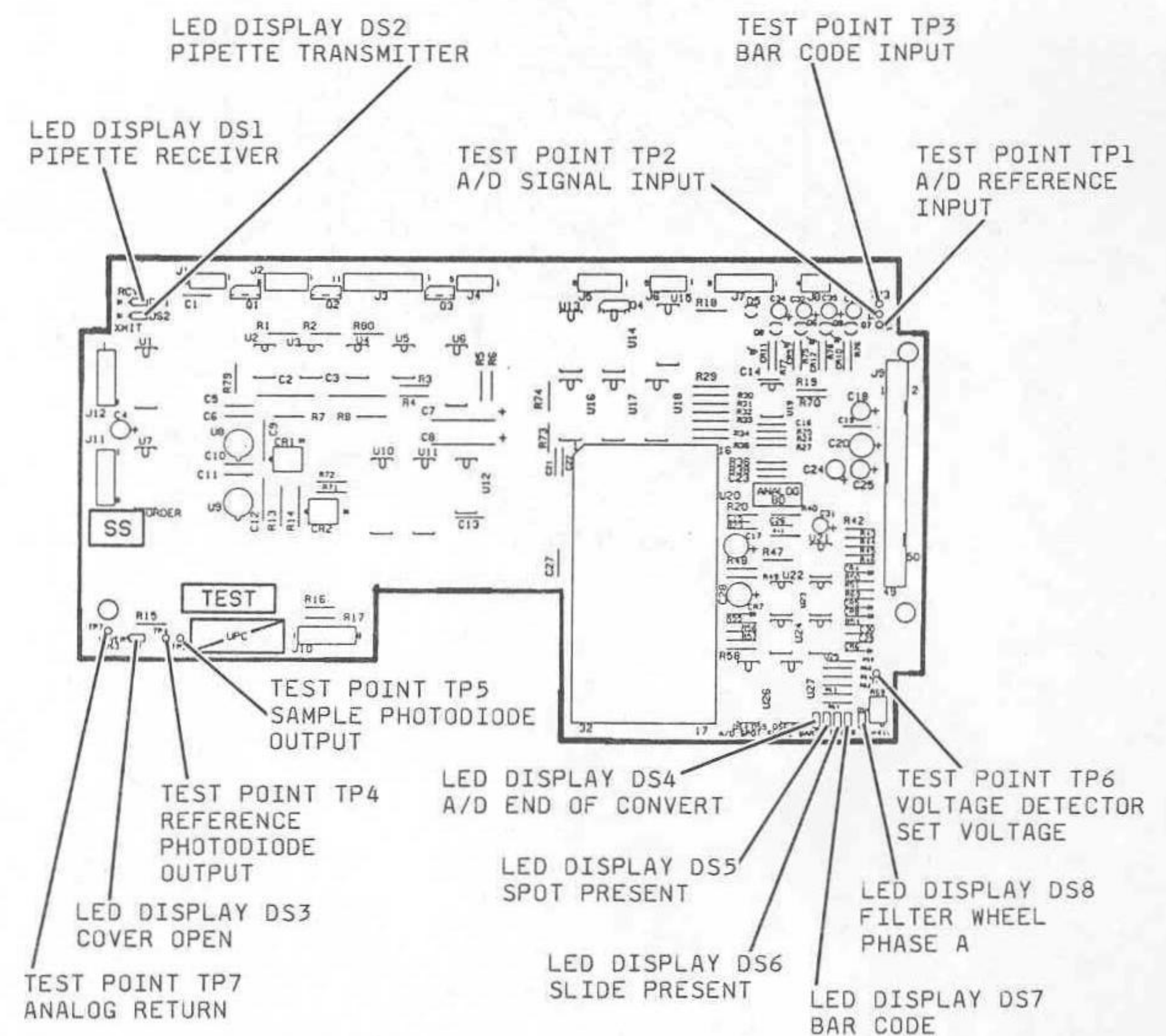


Figure 7 Position of the LED DISPLAYS and TEST POINTS on the ANALOG BOARD

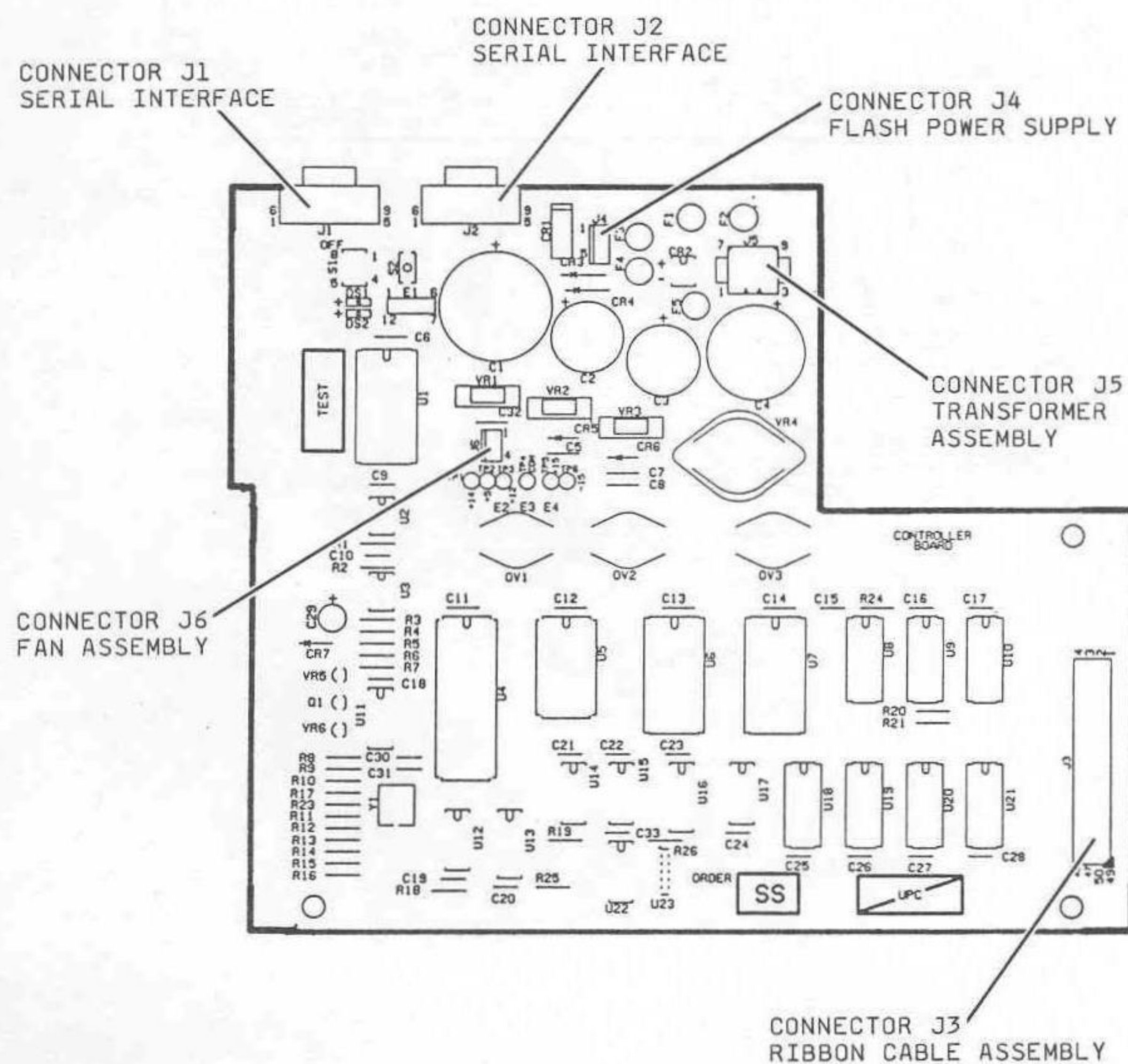


Figure 8 Position of the CONNECTORS on the CONTROLLER BOARD

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1.9

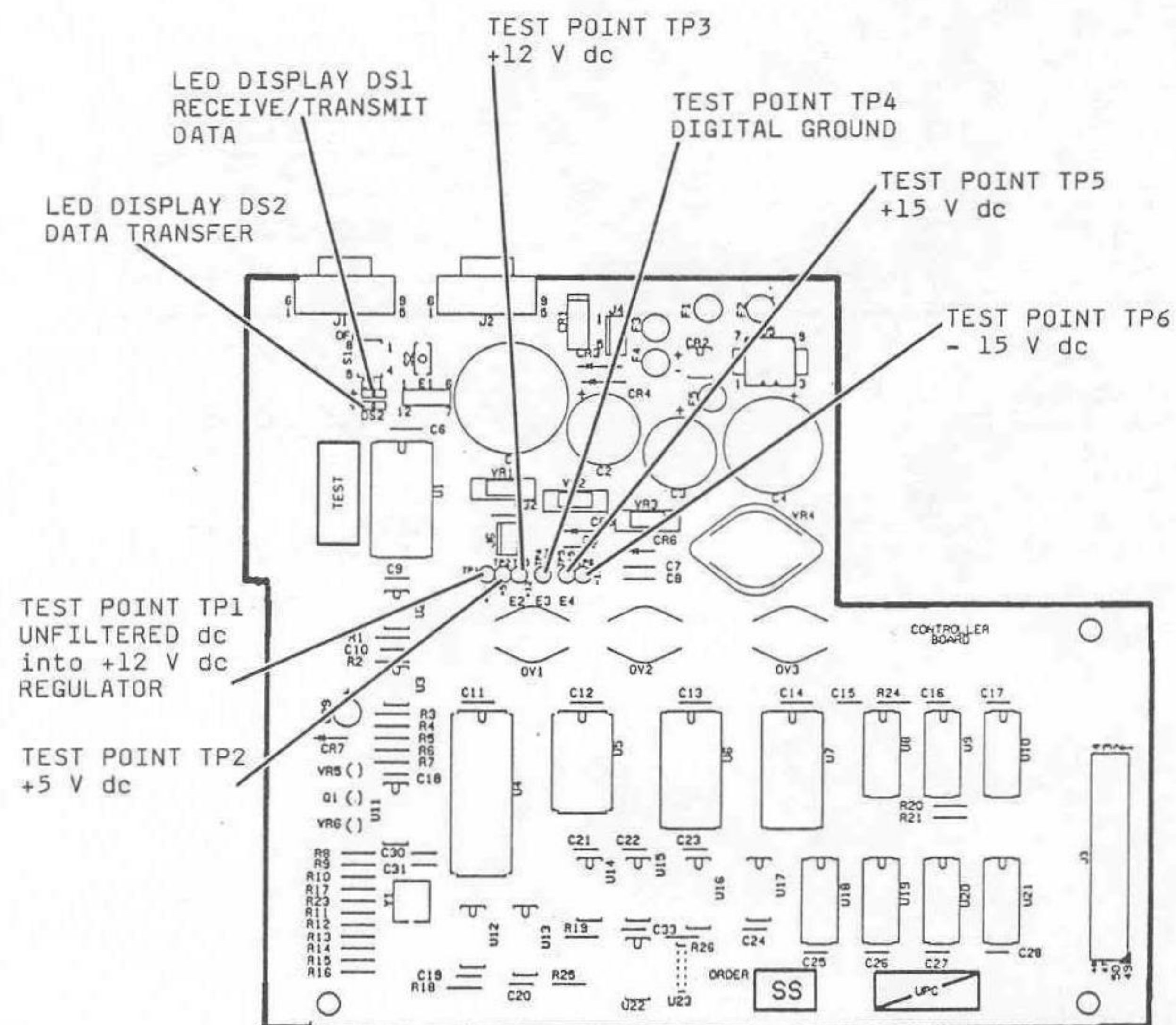
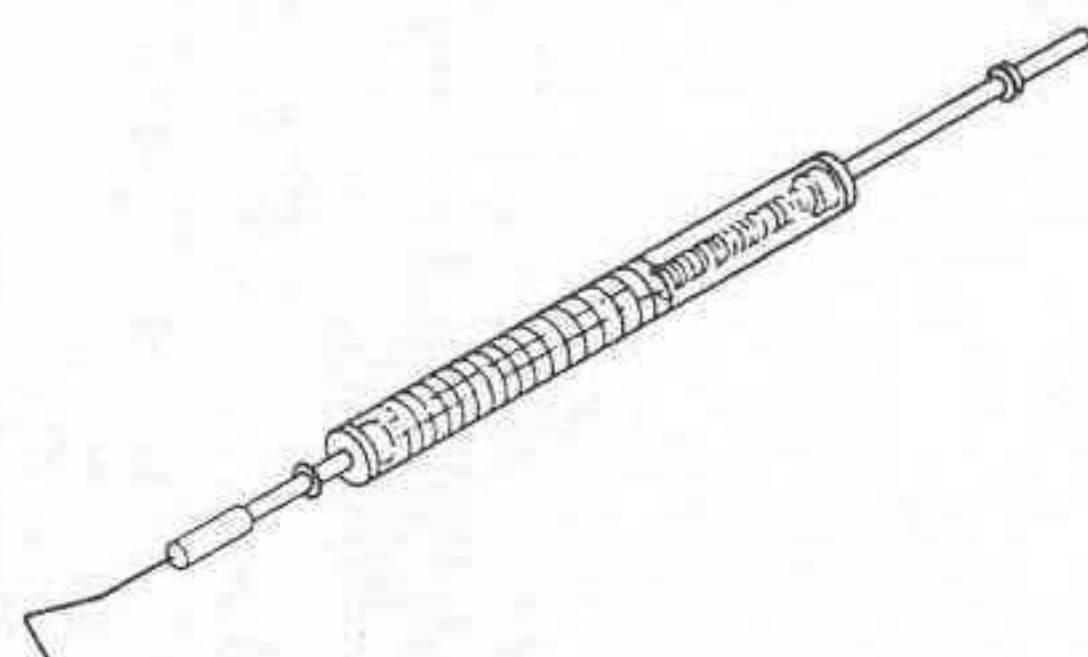


Figure 9 Position of the LED DISPLAYS and TEST POINTS on the CONTROLLER BOARD

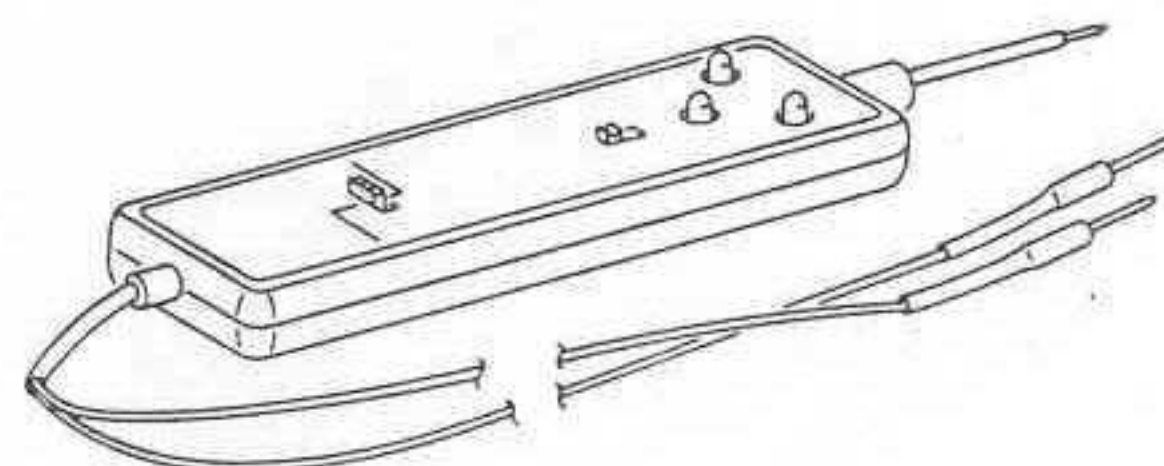
XP3111-1, 4/86

1.10

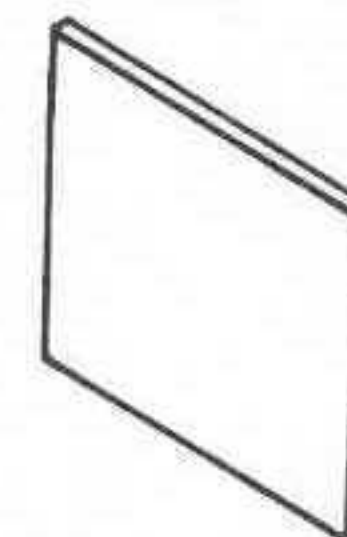
Special Tools



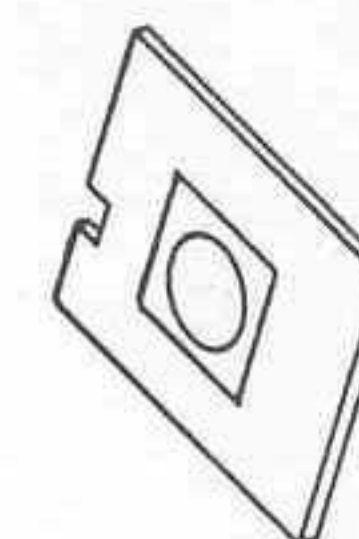
PUSH-PULL SCALE TL-1079



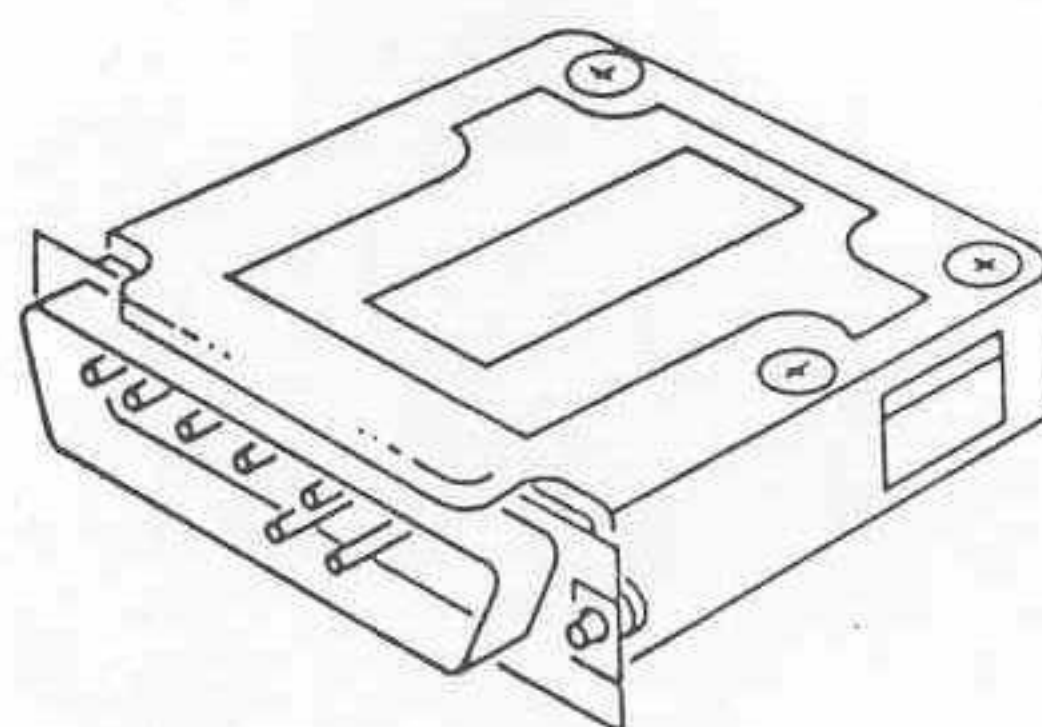
LOGIC PEN TL-3008



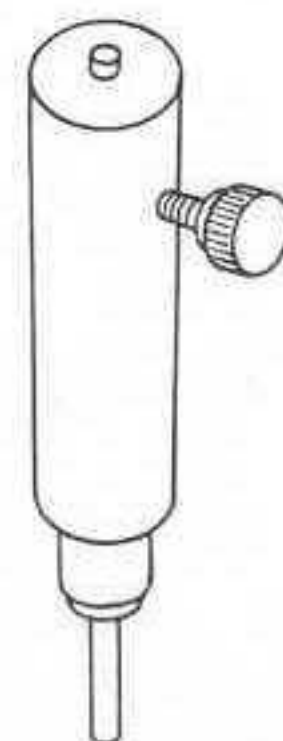
BAR CODE READER
SLIDE TL-3385



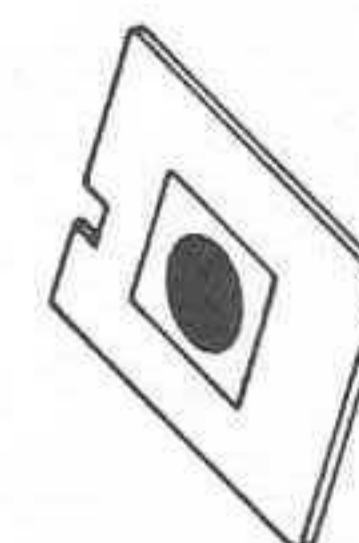
WHITE REFERENCE
SLIDE TL-3575



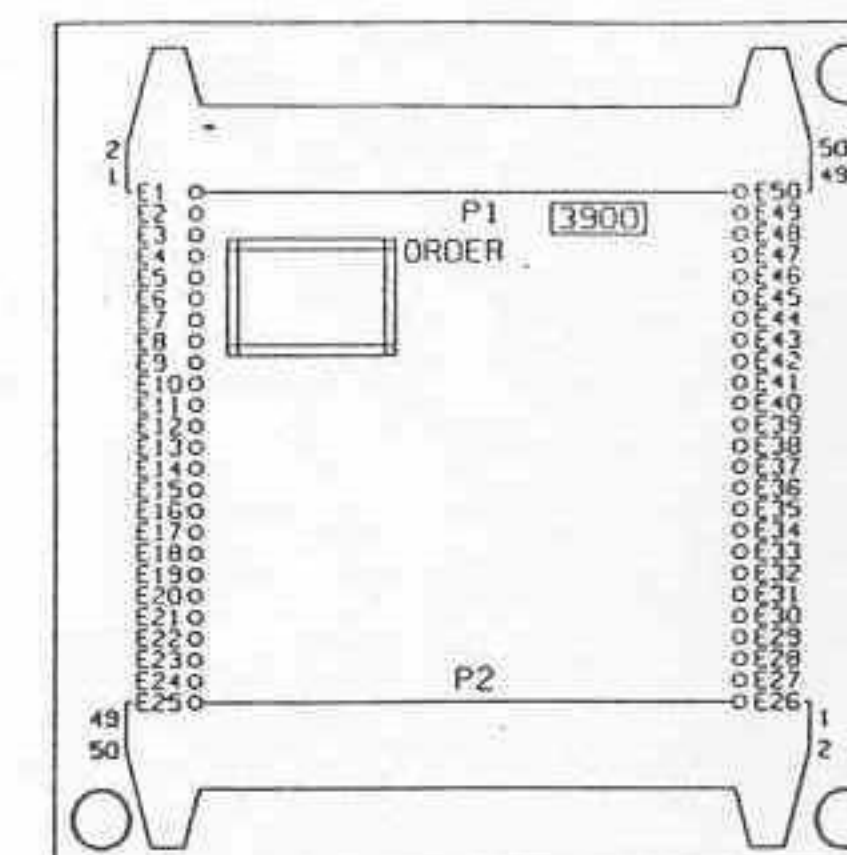
SERIAL LOOPBACK
CONNECTOR TL-3225



TIP HEIGHT ADJUSTMENT
GAUGE TL-3446



BLACK REFERENCE
SLIDE TL-3576



3900/A390 TEST
BOARD TL-3577

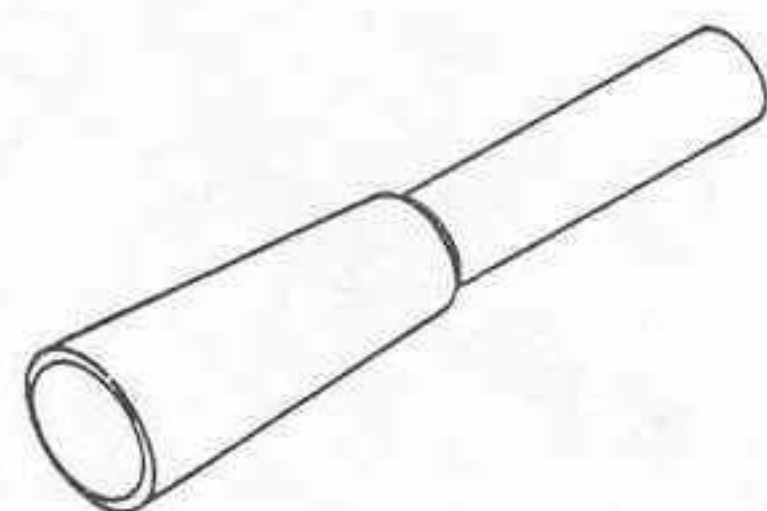
Figure 10

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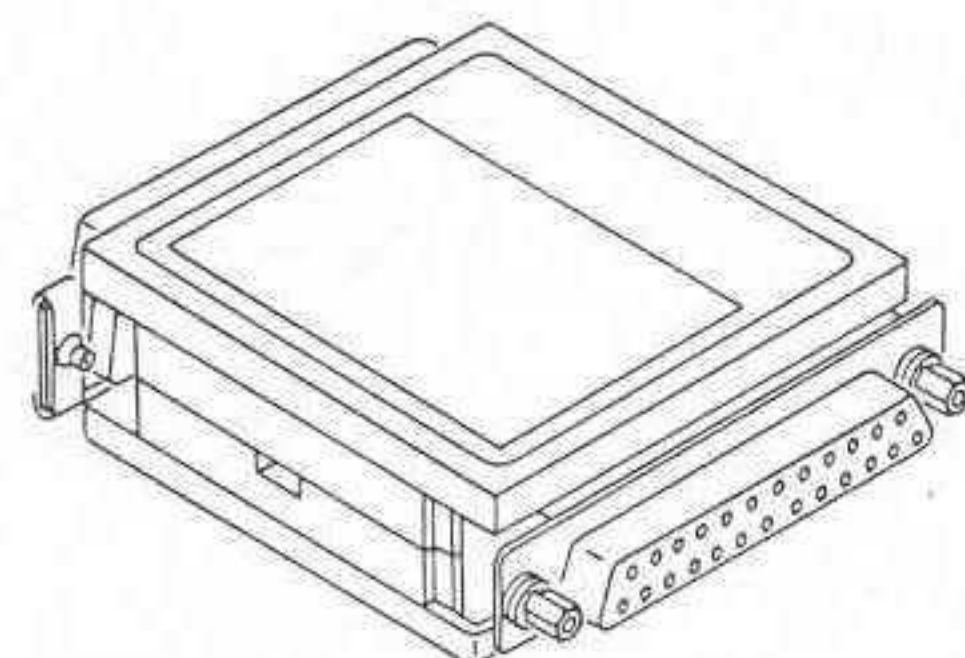
1.11

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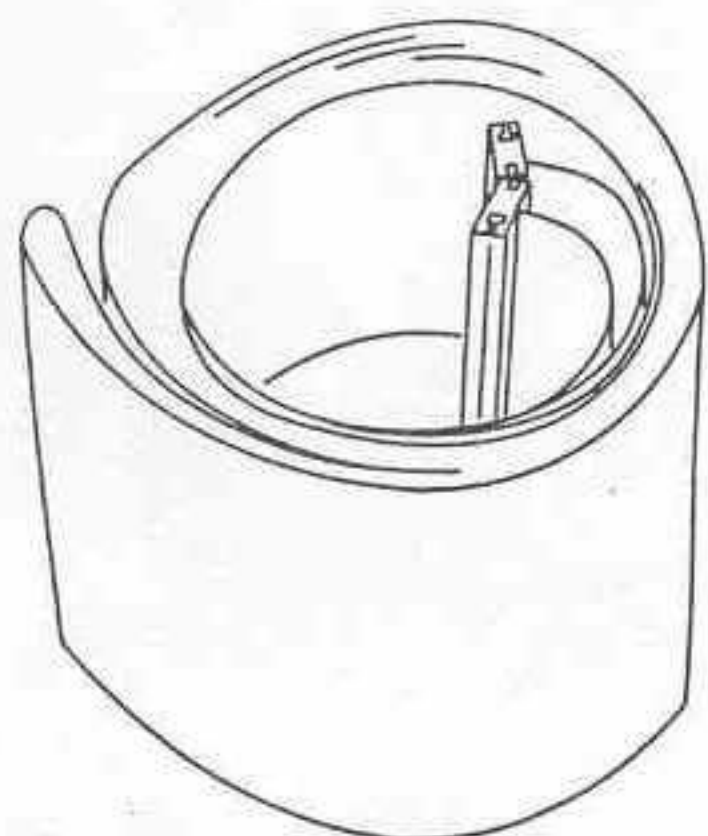
1.12



LAMP REMOVAL
TOOL TL-3580



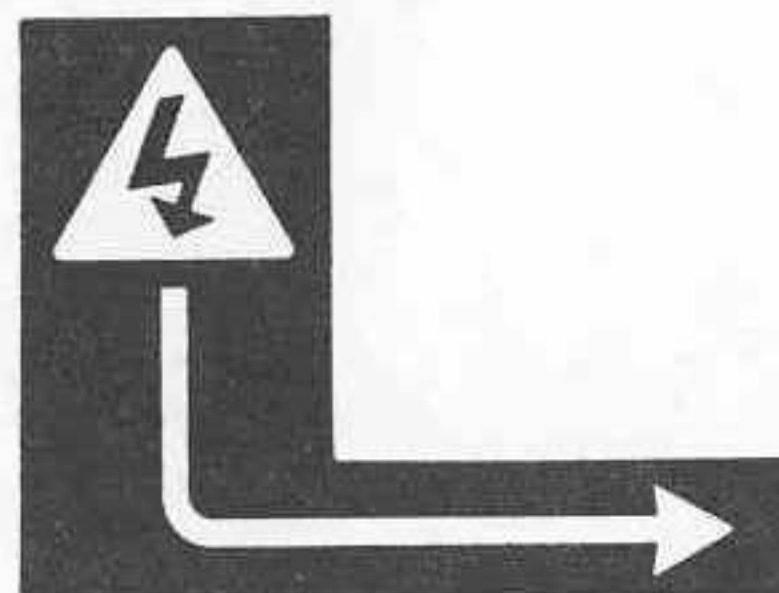
DUAL SOCKET
ADAPTER TL-3606



RIBBON CABLE ASSEMBLY TL-3624

Figure 11

Labels



WARNING - DANGEROUS VOLTAGE

Located on TRACK ASSEMBLY
under the FLASH LAMP COVER
PLATE.

Indicates BASE of FLASH LAMP.



CAUTION LABEL - FRAGILE

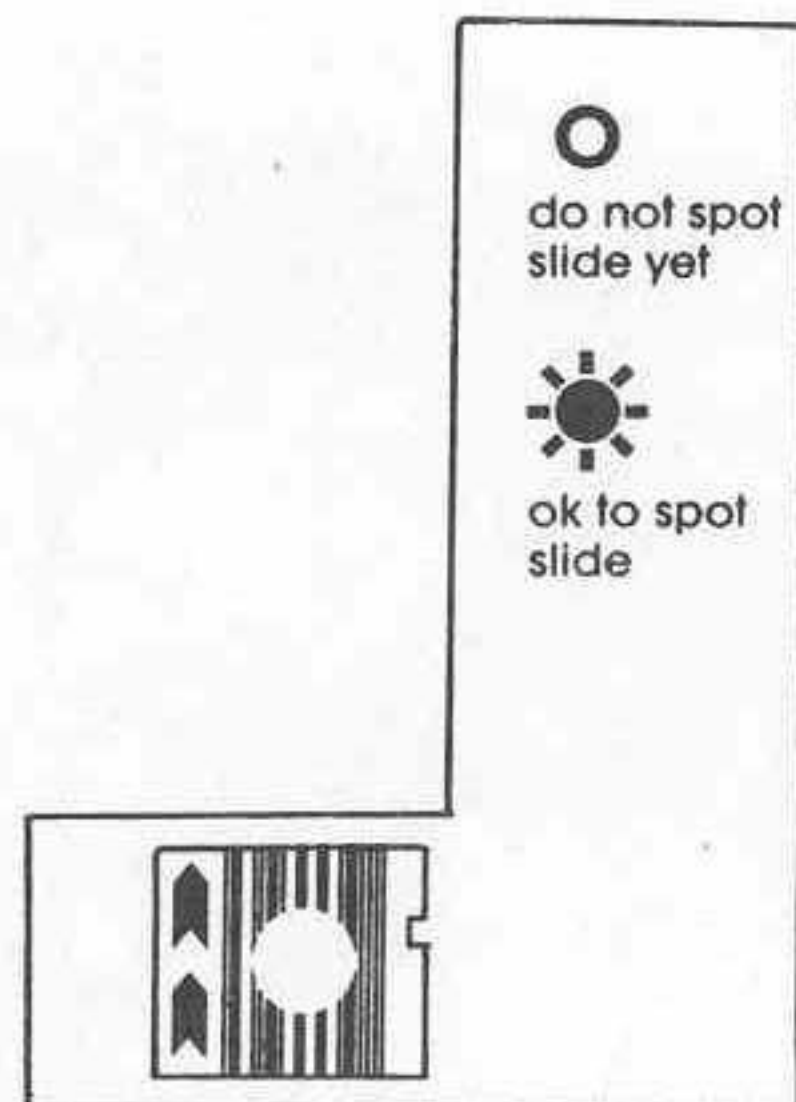
Located on READ ARM COVER.

Indicates damage to SAPPHIRE
WINDOW if READ ARM falls.



WARNING - DANGEROUS VOLTAGE

Located on FLASH ASSEMBLY.



TRACK LABEL

Located on TRACK ASSEMBLY.

Indicates correct slide position
and spotting indication.



FUSE RATING LABEL

Located adjacent to MAIN
POWER SWITCH.

Figure 12

Kodak, Ektachem, and DTSC are trademarks.

4/86
XP3111-1

Customer Equipment Services Division
EASTMAN KODAK COMPANY • ROCHESTER, N.Y. 14650



Printed in USA



Kodak Ektachem DTSC MODULE

Section 2 **Normal Operation**

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HALL EFFECT SENSORS.....	2.23
ANALOG and CONTROLLER BOARD	*
Temperature Control	*
Flash System and Light Path	*
Slide Reading	*
Power Distribution	*
Initialization	*

*** To be provided in a revision.**

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Slide Transport System

Function

The Slide Transport System moves the slides to the correct stations at the correct times to allow the chemistry tests to be processed.

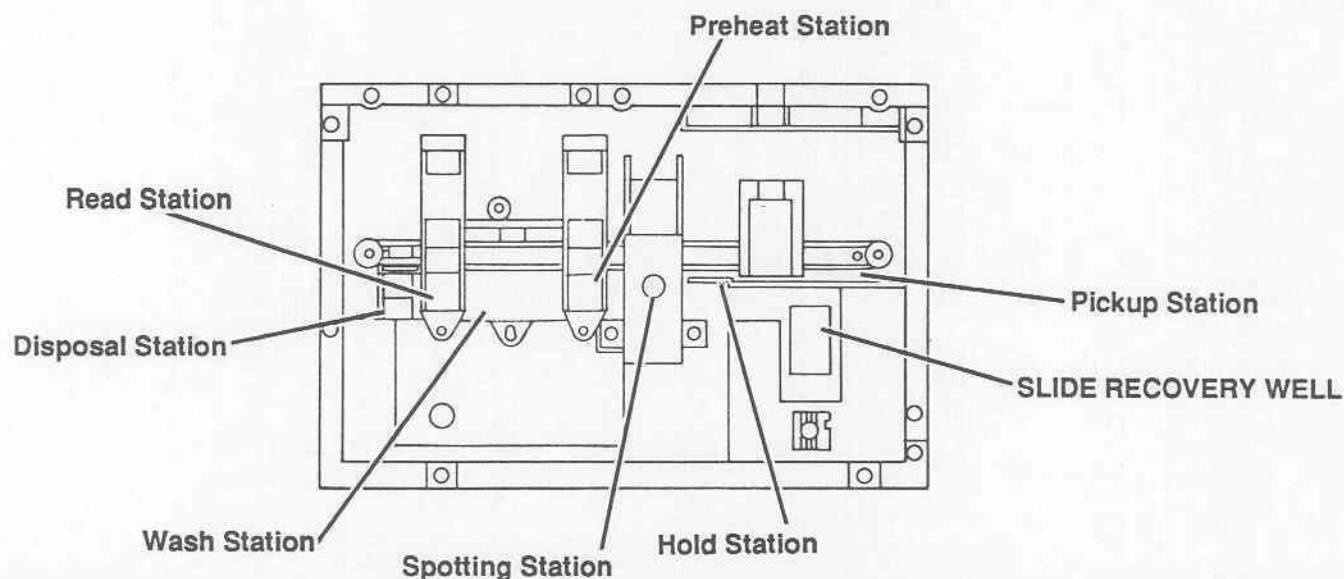
Many operations occur when the slide moves through the slide path. This section is only a general description of the motion of the slide through the *DTSC* MODULE. The following sections will provide more detailed information about the operations that occur at each station.

Components

Slide Stations

The following 7 stations are defined for service purposes:

- Pickup Station. The operator manually inserts the slide at this station. An inserted slide is first detected by the BAR CODE READER at this station. A SLIDE RECOVERY WELL allows the slide to be inserted and removed easily.
- Hold Station. As the slide moves to the Hold Station, the bar code is read by the BAR CODE READER. The slide is identified when it waits at the Hold Station.
- Spotting Station. Fluid is dispensed on the slide at this station.
- Preheat Station. The slide is heated here to the correct temperature, 37.0° C (98.6° F).
- Wash Station. This station is not now used, but could be used for new chemistries.
- Read Station. Chemistry readings are made on the slide at this station.
- Disposal Station. A hole at the end of the TRACK ASSEMBLY allows the processed slide to fall into the SLIDE DISPOSAL CUP.



SLIDE TRANSPORT BELT

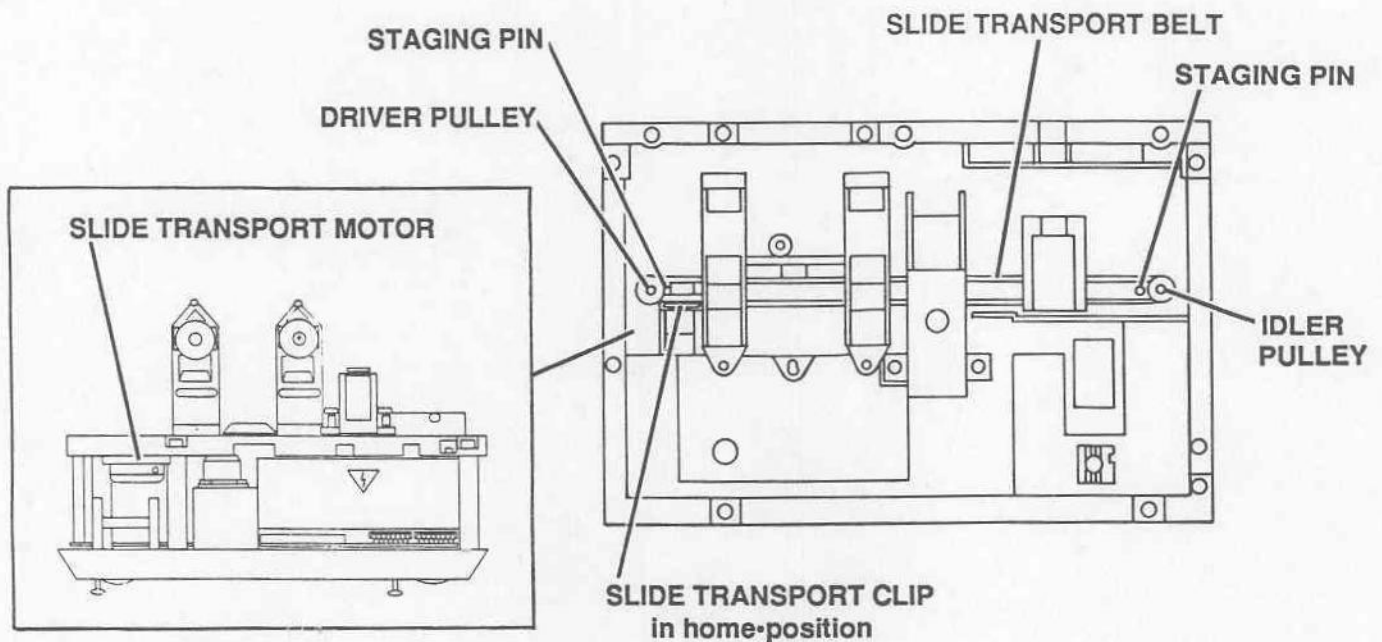
A flexible plastic SLIDE TRANSPORT BELT extends from the DRIVER PULLEY connected to the SLIDE TRANSPORT MOTOR to the IDLER PULLEY near the Pickup Station. The tension of the SLIDE TRANSPORT BELT must be adjusted for correct operation. A special tool, the PUSH-PULL SCALE TL-1079, is used to check the adjustment.

SLIDE TRANSPORT CLIP

The SLIDE TRANSPORT CLIP is connected to the SLIDE TRANSPORT BELT. The SLIDE TRANSPORT CLIP engages the slide and moves it. Home-position for the SLIDE TRANSPORT CLIP is at the left end of the PREHEAT PLATEN ASSEMBLY. During initialization, the SLIDE TRANSPORT CLIP makes contact with a STAGING PIN on the TRACK to stop motion of the SLIDE TRANSPORT BELT. A grinding sound is normal when the SLIDE TRANSPORT CLIP makes contact with the STAGING PIN.

SLIDE TRANSPORT MOTOR/BRACKET ASSEMBLY

The PULLEY on the SLIDE TRANSPORT MOTOR rotates clockwise or counterclockwise to moves the SLIDE TRANSPORT BELT and the SLIDE TRANSPORT CLIP. Clockwise rotation moves the CLIP to the left, and counterclockwise rotation moves the CLIP to the right. The motion of the SLIDE TRANSPORT MOTOR is controlled by step counts transmitted by the DRIVER INTEGRATED CIRCUIT U7 on the ANALOG BOARD. The CONTROLLER BOARD sends drive signals to the ANALOG BOARD. CONNECTOR J11 provides data communication from the ANALOG BOARD to the SLIDE TRANSPORT MOTOR/PULLEY ASSEMBLY.

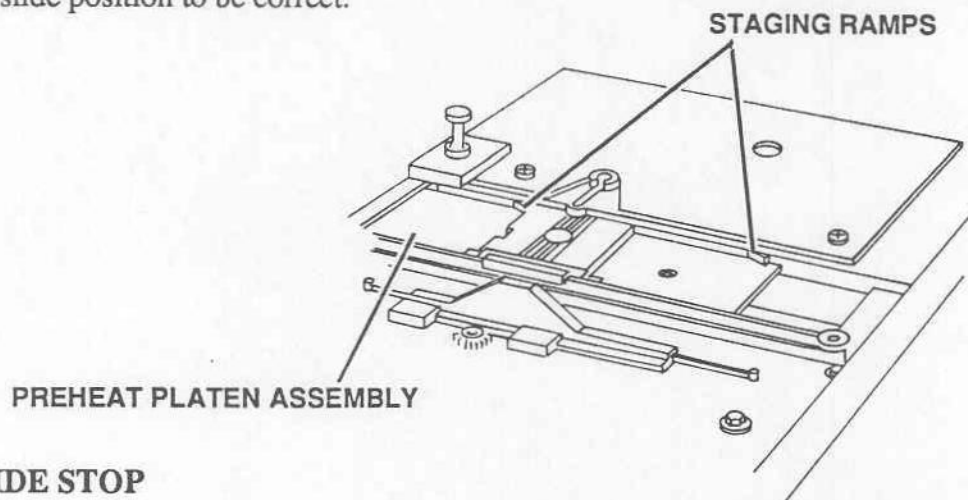


SLIDE TRANSPORT TRACKS

The slide moves within plastic and metal surfaces, the SLIDE TRANSPORT TRACKS. The metal component is a separate part, the PREHEAT PLATEN ASSEMBLY. Heating devices below the PREHEAT PLATEN ASSEMBLY and in the READ ARM and PREHEAT ARM keep the slides at a monitored temperature of 37.0° C (98.6° F.)

STAGING RAMPS

3 STAGING RAMPS are on the side of the TRACKS, at the Preheat, Wash, and Read Station. Another STAGING RAMP is part of the PIPETTE LOCATOR. The slide advances a short distance beyond the STAGING RAMP, and then the direction of the SLIDE TRANSPORT MOTOR reverses to move the slide backward against the STAGING RAMP. This motion causes the slide position to be correct.

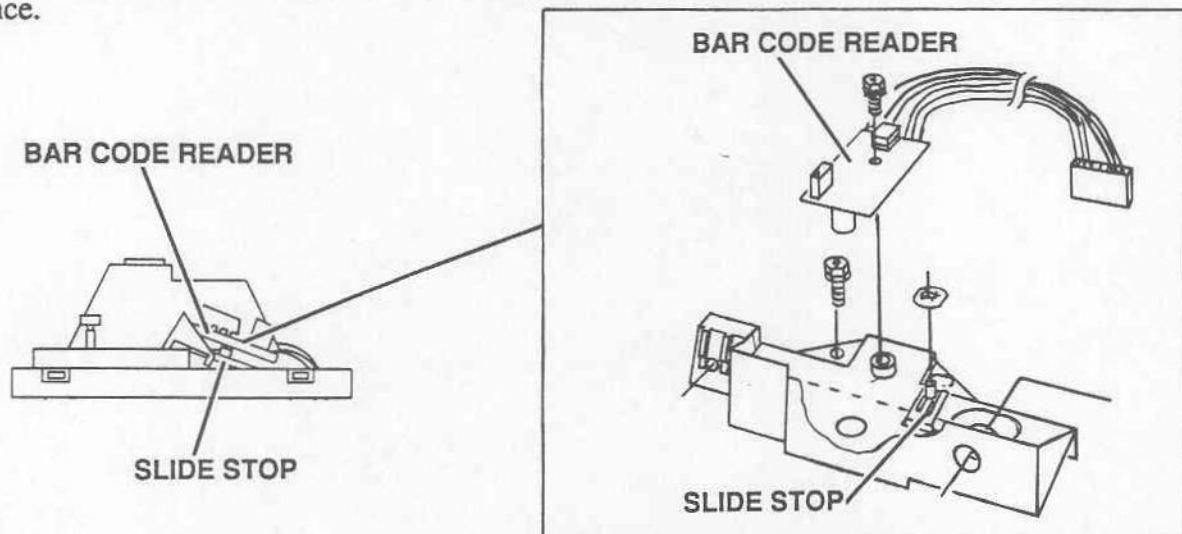


SLIDE STOP

The inserted slide makes contact with the SLIDE STOP. The SLIDE STOP holds the slide in the correct position to allow the SLIDE TRANSPORT CLIP to engage the slide.

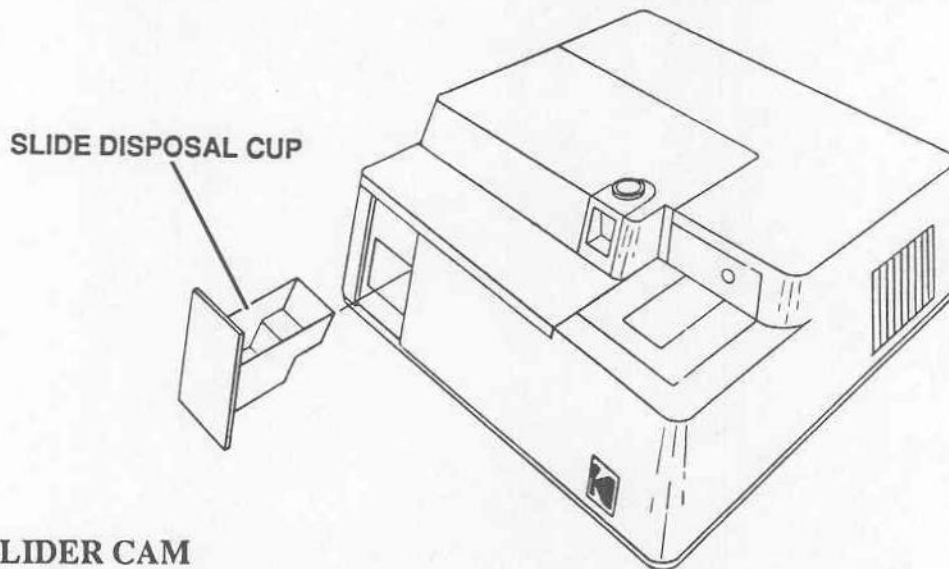
BAR CODE READER

The BAR CODE READER detects that a slide is inserted, and reads the bar code on the slide. The SENSOR on the BAR CODE READER is a Light Emitting Diode which is focused at a set distance.



SLIDE DISPOSAL CUP

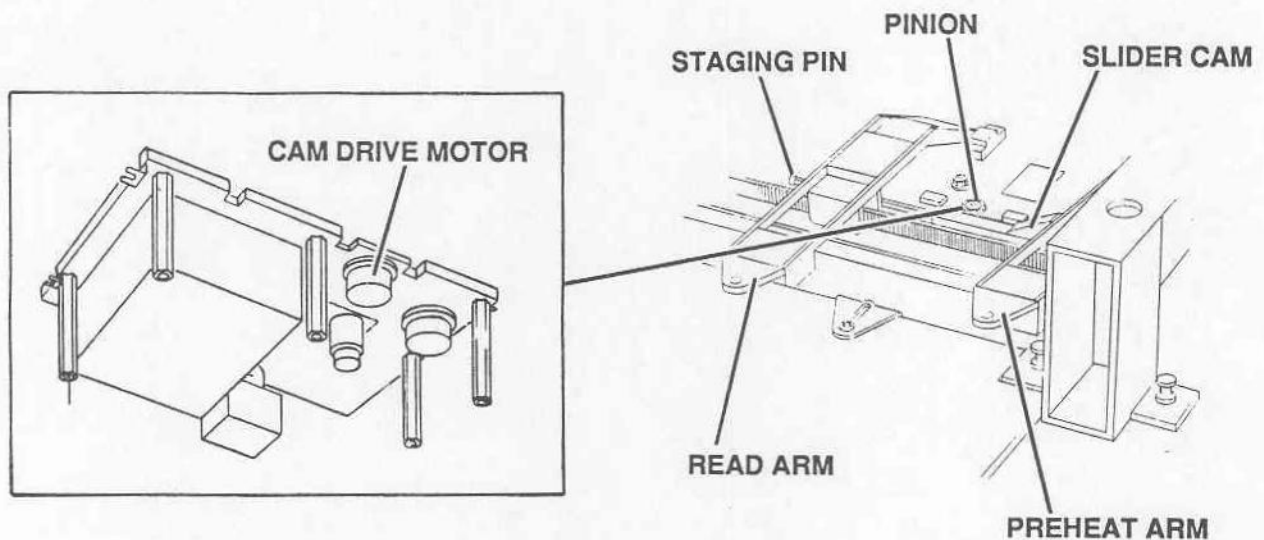
The SLIDE DISPOSAL CUP at the end of the slide path receives the processed slides.

**SLIDER CAM**

The SLIDER CAM moves to the right to lift the PREHEAT ARM, and to the left to lift the READ ARM. Home position for the SLIDER CAM is between the PREHEAT ARM and READ ARM. The 2 STAGING PINS stop the motion of the SLIDER CAM to the right and to the left.

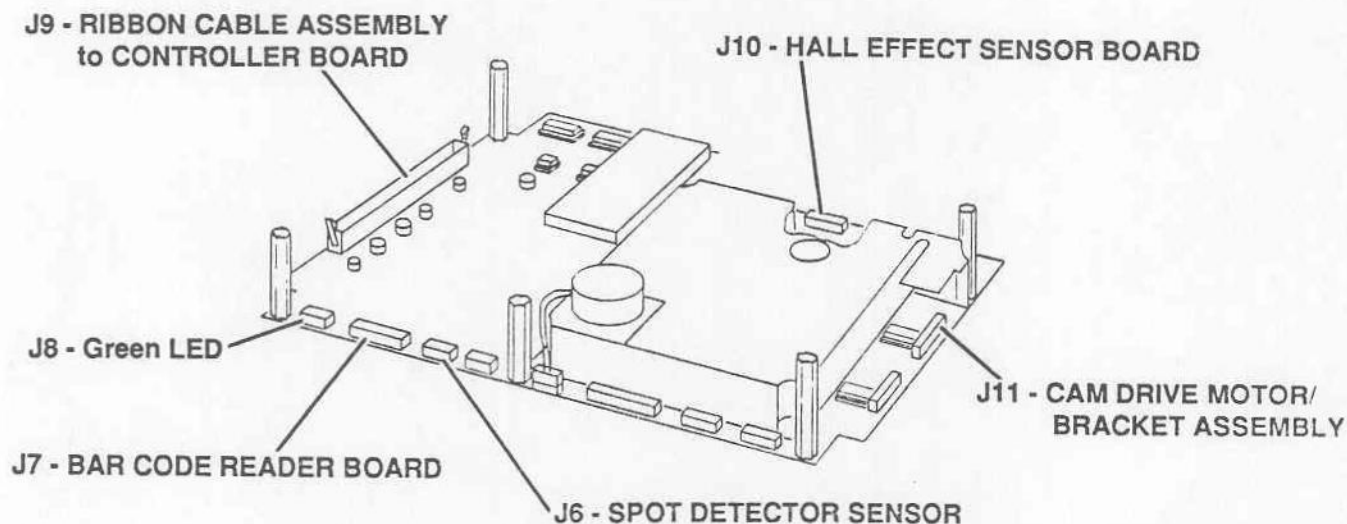
CAM DRIVE MOTOR/BRACKET ASSEMBLY

The PINION on the CAM DRIVE MOTOR/BRACKET ASSEMBLY engages the SLIDER CAM. The PINION rotates clockwise or counterclockwise to move the SLIDER CAM left or right. The motion of the CAM DRIVE MOTOR is determined by step counts sent by DRIVER INTEGRATED CIRCUIT U1 on the ANALOG BOARD. CONNECTOR J12 provides data communication from the ANALOG BOARD to the CAM DRIVE MOTOR. The CONTROLLER BOARD sends drive signals to the ANALOG BOARD.



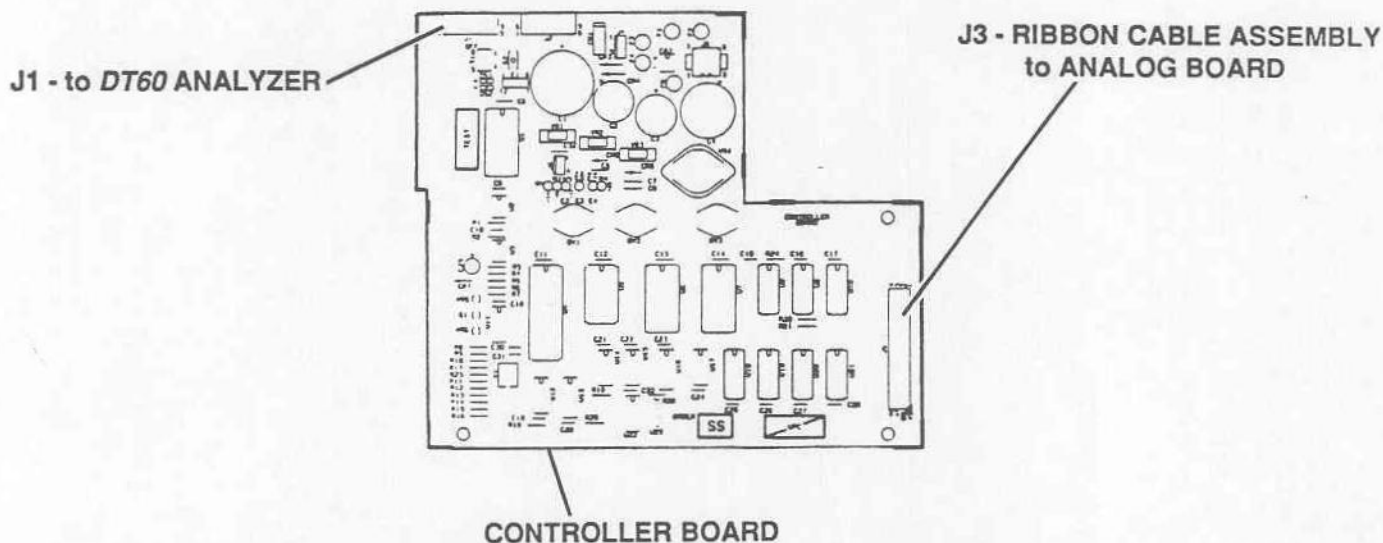
ANALOG BOARD

The ANALOG BOARD receives data from and transfers signals to almost all of the operating components in the DTSC MODULE. To operate the Slide Transport System, the ANALOG BOARD has DRIVER INTEGRATED CIRCUITS that operate the SLIDE TRANSPORT MOTOR and the CAM DRIVE MOTOR. DRIVER INTEGRATED CIRCUIT U7 sends step counts to the SLIDE TRANSPORT MOTOR. DRIVER INTEGRATED CIRCUIT U1 sends step counts to the CAM DRIVE MOTOR. The following figure gives the CONNECTORS that provide data communication with the components described in this section.



CONTROLLER BOARD

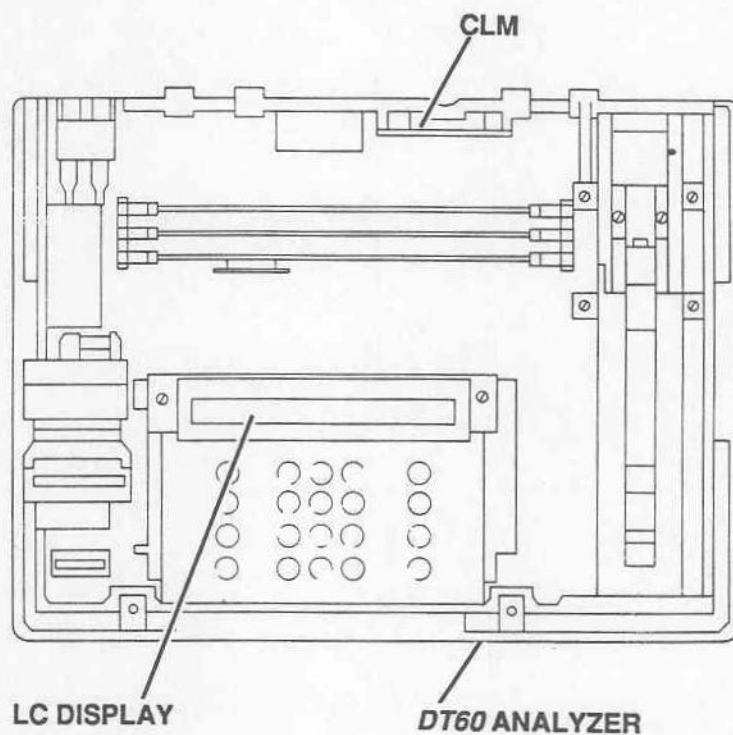
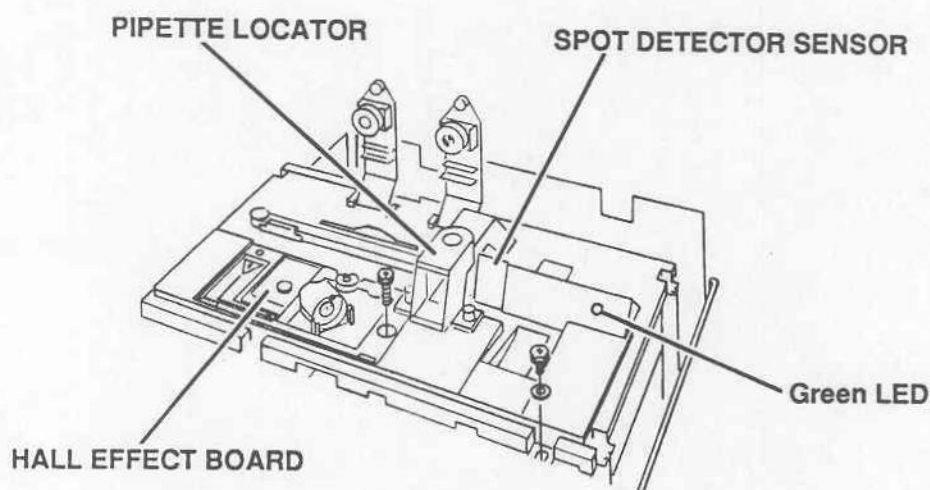
CONNECTOR J9 on the ANALOG BOARD transfers data from the SENSORS to the CONTROLLER BOARD. Then the CONTROLLER BOARD executes command signals to the ANALOG BOARD that indicate the correct times to operate the SLIDE TRANSPORT MOTOR and the CAM DRIVE MOTOR. A RIBBON CABLE which is permanently attached to CONNECTOR J3 provides data communication with the ANALOG BOARD. CONNECTOR J1 on the CONTROLLER BOARD provides data communication with the computers in the DT60 ANALYZER.



Other Components

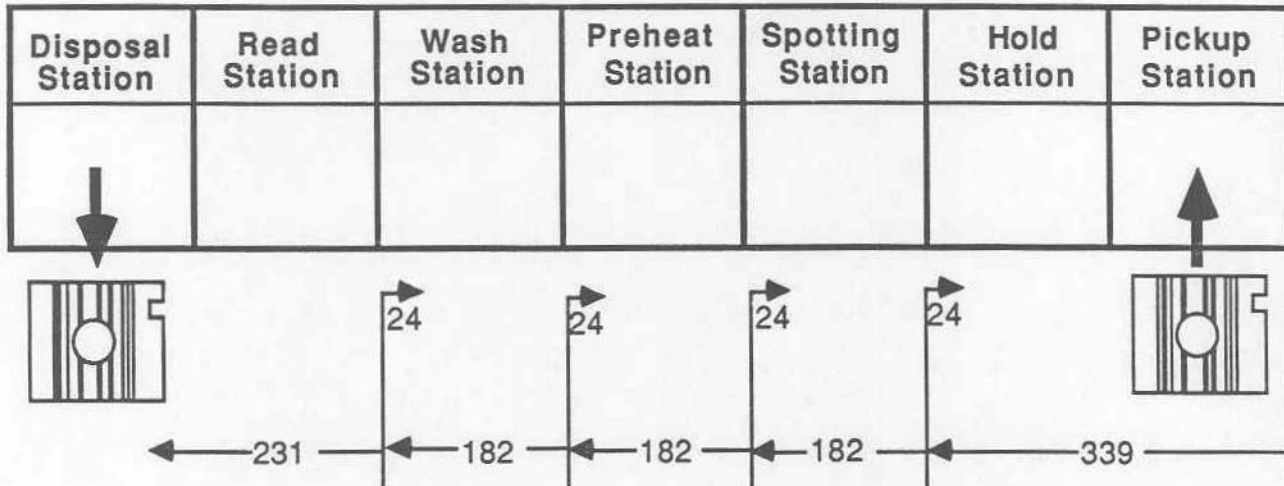
You should be able to identify the following parts, which are described in other sections of "Normal Operation":

- PIPETTE LOCATOR
- SPOT DETECTOR SENSOR
- Green LED
- HALL EFFECT BOARD
- CLM — in the *DT60* ANALYZER
- LC DISPLAY — in the *DT60* ANALYZER



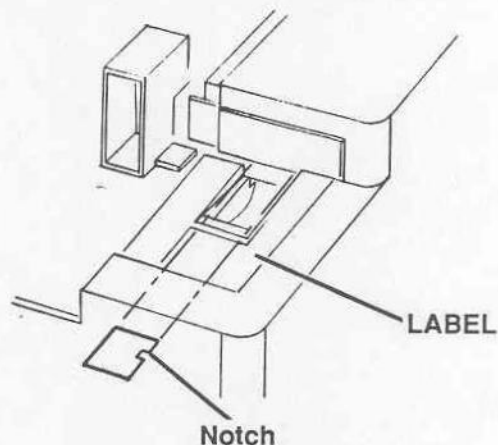
Step Count Diagram

The following figure indicates the complete motion of the SLIDE TRANSPORT CLIP. The numbers indicate an approximate number of steps the SLIDE TRANSPORT MOTOR moves the SLIDE TRANSPORT CLIP for each station.

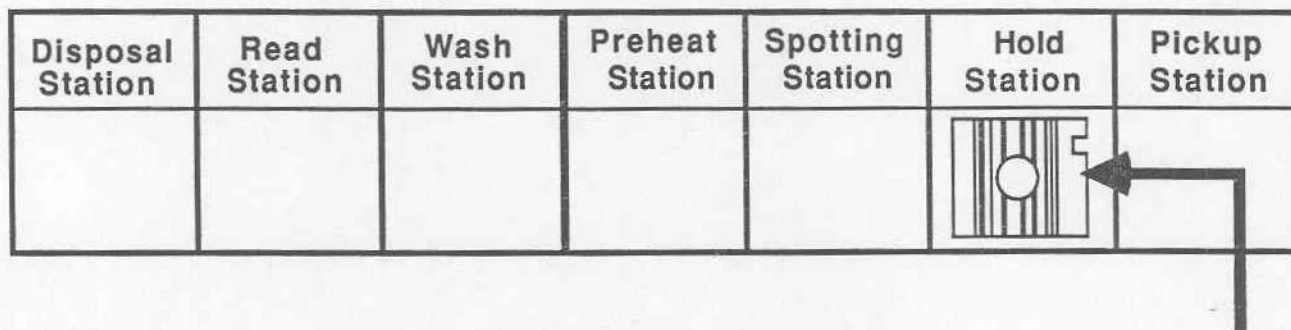


Sequence of Operation

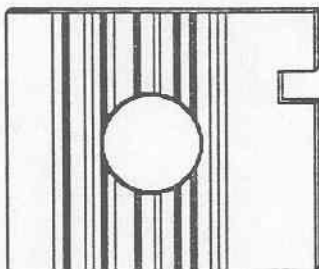
1. Slides are inserted manually at the Pickup Station. The slides are inserted with the bar code up, and the notch toward the right. The LABEL adjacent to the Pickup Station indicates the correct position for inserting slides.



2. The BAR CODE READER emits a light beam to the TRACK. The white surface of an inserted slide reflects the light up to the BAR CODE READER, executing a signal to the ANALOG BOARD. The ANALOG BOARD sends a message to the CONTROLLER BOARD. This signal begins the operating sequence.
3. The CONTROLLER BOARD sends a signal to the ANALOG BOARD. The ANALOG BOARD executes a signal to the SLIDE TRANSPORT MOTOR to begin operation. The PULLEY on the SLIDE TRANSPORT MOTOR rotates counterclockwise to move the SLIDE TRANSPORT BELT.
4. The SLIDE TRANSPORT CLIP is connected to the SLIDE TRANSPORT BELT. When the BELT moves, the CLIP moves from home position to the Pickup Station.
5. The CLIP engages the slide at the Pickup Station. There is no device to detect that the slide is engaged, and the motion of the BELT and the CLIP is determined only by the step count signal to the SLIDE TRANSPORT MOTOR.
6. The DRIVER PULLEY then rotates clockwise, to move the CLIP and the slide under the BAR CODE READER. The BAR CODE READER reads the bar code on the slide. The slide moves in one continual motion to the Hold Station.

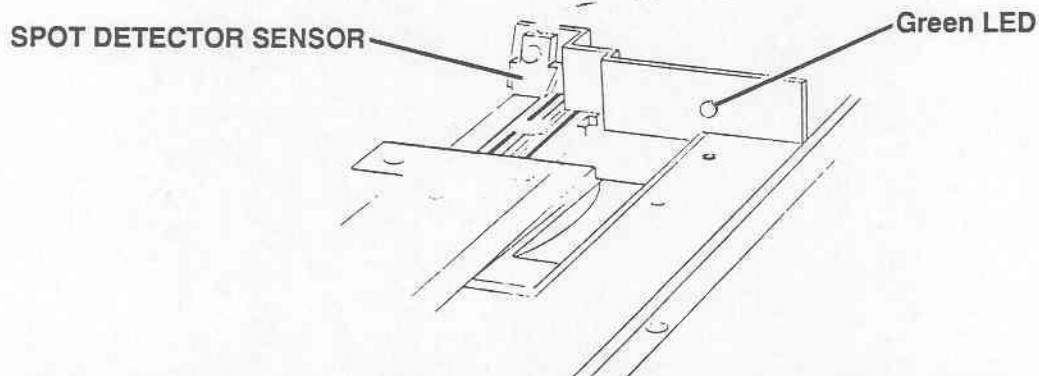


7. The bar code data is sent to the CONTROLLER BOARD. The CONTROLLER BOARD transfers the data to the *DT60* ANALYZER for identification.
8. The bar code data is compared with data stored in the CDM in the *DT60* ANALYZER to check the status of the chemistry. The *DT60* ANALYZER then sends a response to the *DTSC* MODULE.
9. For the slide to be successfully identified as a rate slide, at least the first 3 bars must be decoded. If the bar code is partially decoded, the message "SLIDE NOT IDENTIFIED / SELECT TEST" is displayed. The operator must manually select the test on the KEYBOARD.

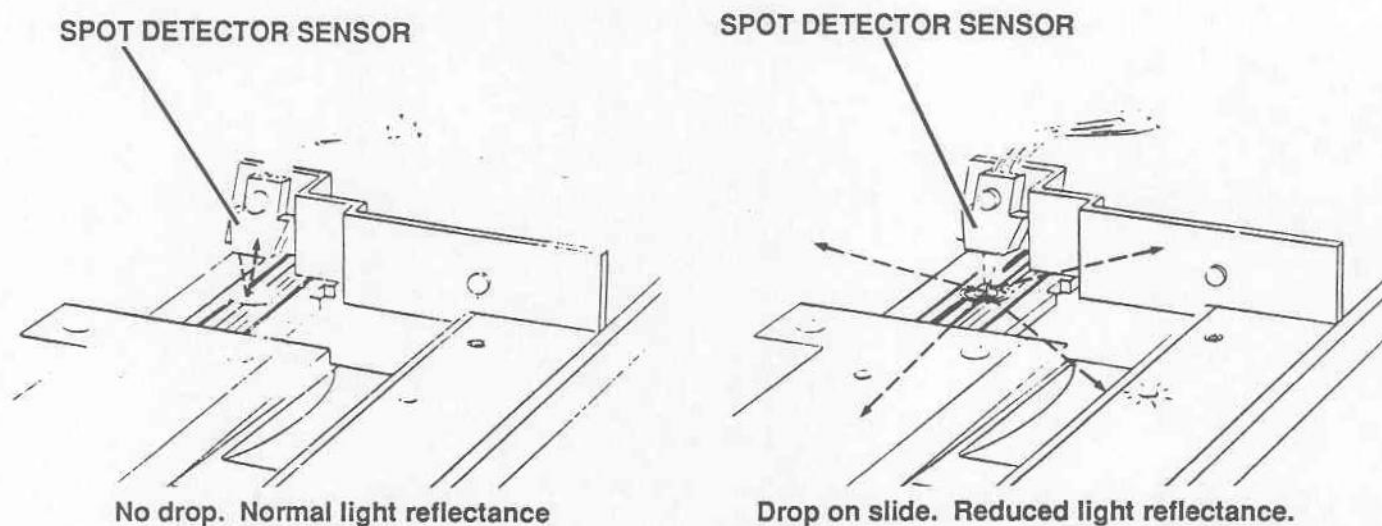


These 3 bars identify rate slides

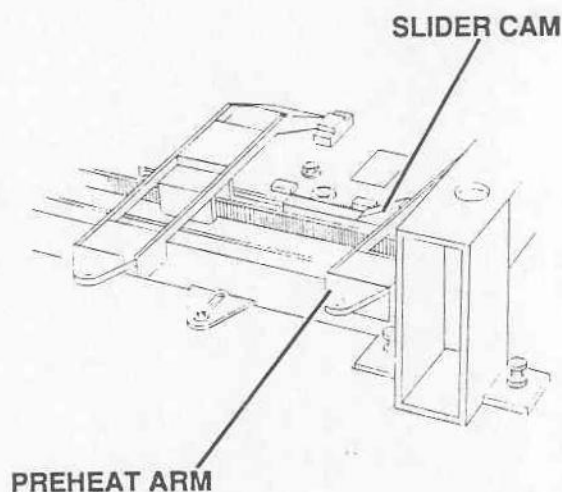
10. Data is read from the CLM that checks if the chemistry of the slide is compatible with the data in the CLM. The chemistry of the slide must exist in the CLM, and the chemistry must be calibrated for the generation number of the slide.
11. If the chemistry is not included in the CLM, or is not calibrated for the generation number of the slide, the message "SLIDE NOT IDENTIFIED" is displayed. The *DT60* ANALYZER sends a message to the *DTSC* MODULE that causes the slide to be returned to the Pickup Station.
12. If the chemistry is included in the CLM and is calibrated for the generation number, the *DT60* ANALYZER sends all data necessary for processing the slide to the *DTSC* MODULE. The name of the chemistry is displayed. The slide advances to the Spotting Station.
13. The slide advances a short distance beyond the Spotting Station, and then the direction of the BELT reverses to move the slide backward against the STAGING RAMP. The motion of the BELT is determined only by step count to the SLIDE TRANSPORT MOTOR, and there is no device to check that the slide is in the correct position.
14. The white surface of the slide causes the SPOT DETECTOR SENSOR to detect a change in reflectance. After 3 seconds, the message "SPOT SLIDE WITH FLUID" is displayed. The 3 second delay allows the SPOT DETECTOR SENSOR to stabilize. The green LED flashes and a tone occurs to indicate to the operator that the slide is ready for sample fluid.



15. The SPOT DETECTOR SENSOR monitors the reflectance of the slide. When fluid is dispensed on the slide, the reflectance is reduced. This change causes the SPOT DETECTOR SENSOR to execute a signal to the ANALOG BOARD.

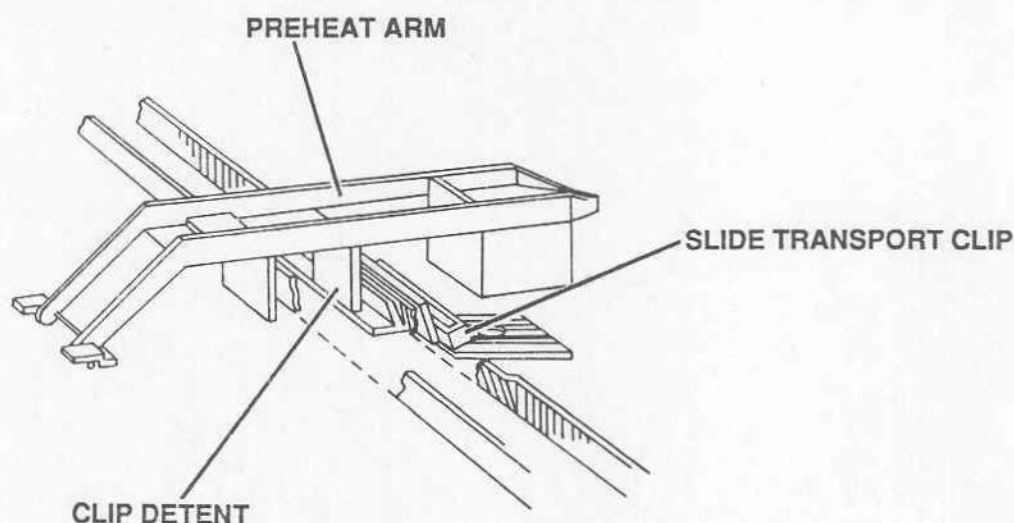


16. The green LED stops flashing, and the message "WAIT - SLIDE BEING LOADED" is displayed. The CONTROLLER BOARD executes a signal for the SLIDE TRANSPORT MOTOR that causes motion of the slide to the Preheat Station.
17. At the same time, the CAM DRIVE MOTOR is energized. The SLIDER CAM moves from home position to the right, lifting the PREHEAT ARM to allow the slide to move below it.

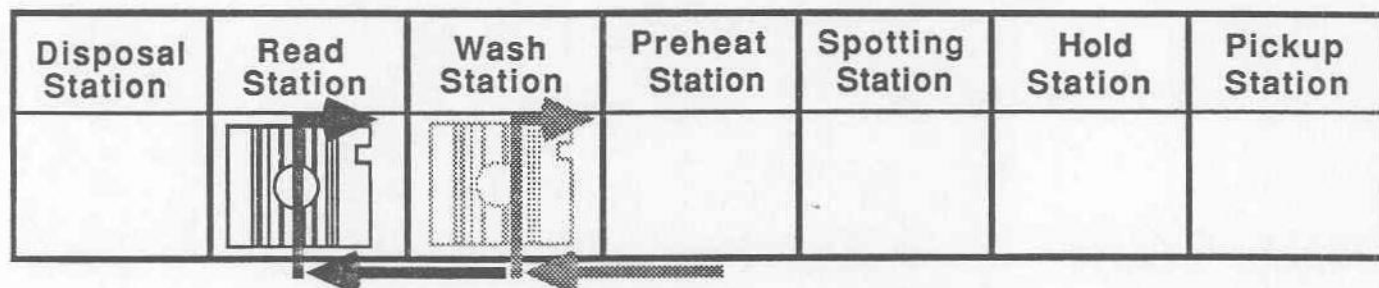


18. The slide advances a short distance beyond the Preheat Station, and then the direction of the SLIDE TRANSPORT MOTOR reverses, causing the slide to move backward against the STAGING RAMP. The motion is controlled only by the step count to the SLIDE TRANSPORT MOTOR, and there is no device to detect that the slide is in the Preheat Station.

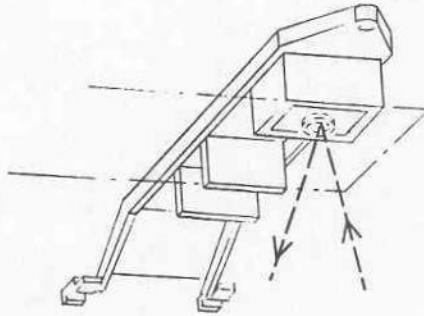
19. The CAM DRIVE MOTOR moves the SLIDER CAM to the left, causing the PREHEAT ARM to move down over the slide. The CLIP DETENT on the PREHEAT ARM compresses the CLIP and raises it from the slide.



20. The DTSC MODULE is now ready to receive another slide at the Pickup Station. If the operator inserts an additional slide, the CONTROLLER BOARD will monitor the motions of the CLIP to move each slide to the correct station at the correct time. If the CLIP must move through the Preheat Station or the Read Station when the ARMS are down, the CLIP DETENTS on the ARMS cause the CLIP to be bent back on the flexible BELT, so that the CLIP will not engage any slides under the ARMS.
21. The time that the slide remains in the Preheat Station is determined by the type of chemistry. This data was sent from the CLM when the slide was identified.
22. When the time is completed, the CAM DRIVE MOTOR moves the SLIDER CAM to the right. The CAM lifts the PREHEAT ARM and allows the CLIP to engage the slide.
23. The SLIDE TRANSPORT MOTOR then moves the CLIP and the slide to the Wash Station. The slide moves backward against the STAGING RAMP, then continues to move toward the Read Station.

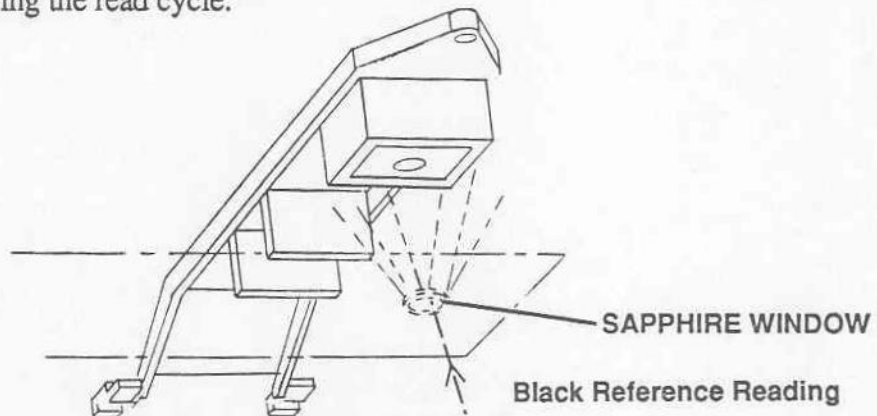


25. The FLASH LAMP energizes to take a reading of the WHITE REFERENCE on the bottom of the READ ARM. This reading will be used for a white reference reading during the read cycle.

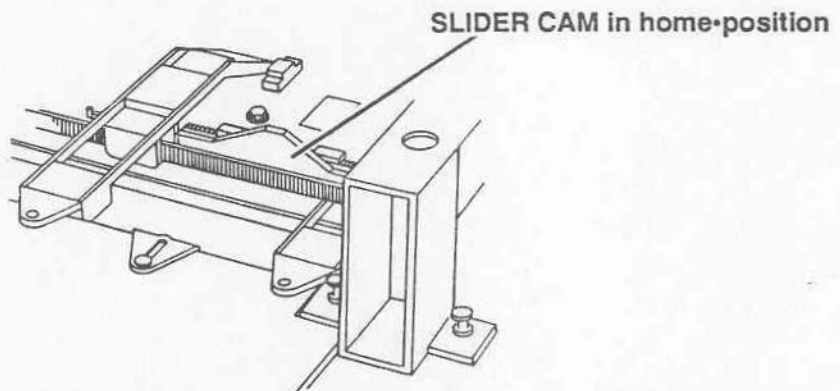


White Reference Reading

26. The SLIDER CAM does not stop at home•position, but continues to move to the left, lifting the READ ARM. The HALL EFFECT SENSOR detects that the READ ARM is up.
27. When the READ ARM is up, the FLASH LAMP energizes again. Because no surface reflects the light down through the SAPPHIRE WINDOW, this reading will be used for a black reference reading during the read cycle.



28. The slide advances a short distance beyond the Read Station, and then the direction of the BELT reverses, causing the slide to move backward against the STAGING RAMP. This motion moves the slide directly above the SAPPHIRE WINDOW.
29. The SLIDER CAM moves to home•position. The READ ARM moves down over the slide.



30. The HALL EFFECT SENSOR detects that the slide is under the READ ARM. If no slide is in the Read Station, error code F31 occurs.
31. The data for the number of readings was sent from the CLM when the the BAR CODE was identified. The FLASH POWER SUPPLY energizes the FLASH LAMP for the necessary number of readings.
32. When the reading cycle is completed, the results are printed.
33. The SLIDER CAM moves left, lifting the READ ARM. The CLIP engages the slide. The HALL EFFECT SENSOR detects that the READ ARM is up.
34. The CLIP moves the slide to the Disposal Station, and the slide falls into the DISPOSAL CUP. The CLIP is now in the home•position.
35. At the same time, the SLIDER CAM moves right, to the home•position. The READ ARM moves down.

Slide Identification System

Function

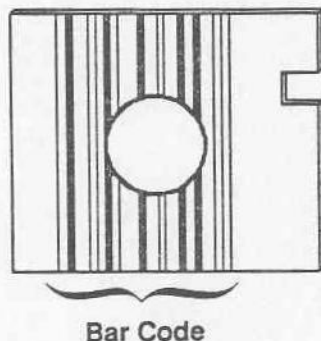
The Slide Identification System first detects that a slide is inserted into the Pickup Station, and then executes a signal to start the operation sequence. The Slide Identification System also decodes the information in the bar code on the slide and transfers the information to the ANALOG BOARD. With this data, the CLM in the *DT60* ANALYZER first determines if the slide is an acceptable chemistry, calibrated for the equipment. Then the *DT60* ANALYZER sends data to the *DTSC* MODULE that is used to determine the following functions:

- the time the slide should remain in the Preheat Station
- the filter used to read the slide
- the number of flash readings that must be made.

Components

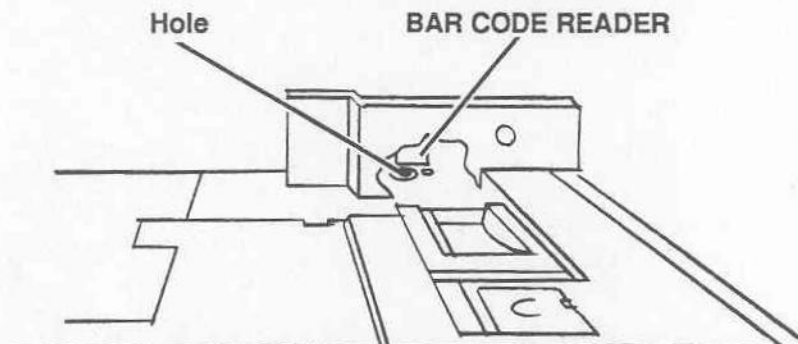
Bar Codes

Kodak Ektachem DT Slides have bar codes, a sequence of black and white lines of different widths. The bar code is decoded for necessary information about the chemistry of the slide, and the generation number of the emulsion.

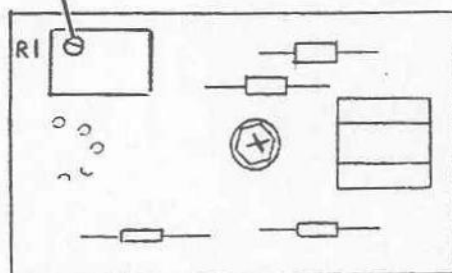
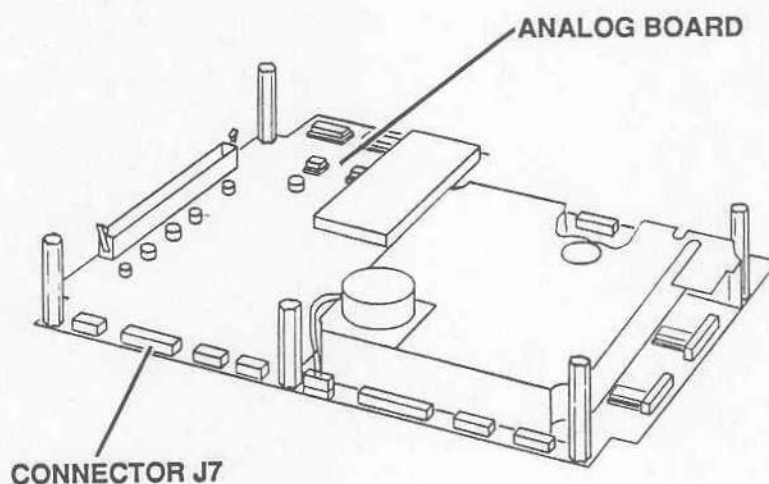


BAR CODE READER

The BAR CODE READER has a Light Emitting Diode that emits a beam of light, and a Photo Diode that receives the light reflected from the slide. The beam is projected through a hole in the TRACK, which allows no light to be reflected up to the BAR CODE READER until a slide is inserted. As the slide moves under the BAR CODE READER, the bar code is read.

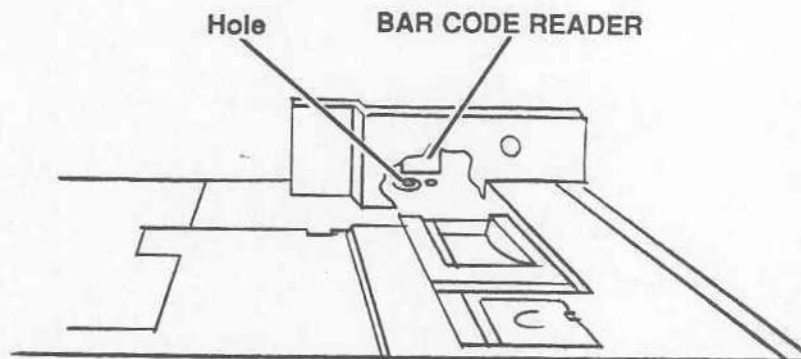
**BAR CODE READER BOARD**

The BAR CODE READER BOARD monitors the data input functions for the Slide Identification System. POTENTIOMETER R1 is adjusted to emit a specified voltage for the maximum white reflectance obtained from a slide. The CONNECTOR J7 connects the BAR CODE READER BOARD to the ANALOG BOARD for data communication.

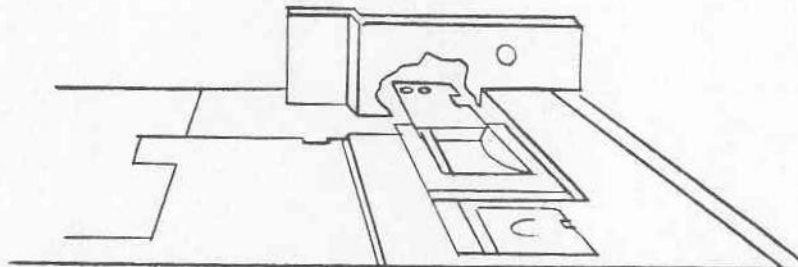
POTENTIOMETER R1**BAR CODE READER BOARD**

Sequence of Operation

1. When the *DTSC* MODULE is initialized, the BAR CODE READER projects a light to a hole in the TRACK. The hole allows almost no light to be reflected up to the BAR CODE READER.



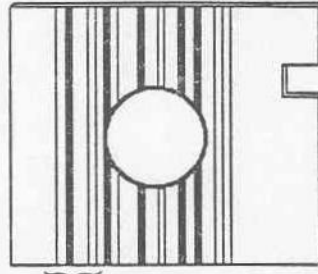
2. The white surface of an inserted slide reflects light to the BAR CODE READER, which causes a signal to the ANALOG BOARD. The ANALOG BOARD sends a message to the CONTROLLER BOARD. This signal begins the operation sequence.



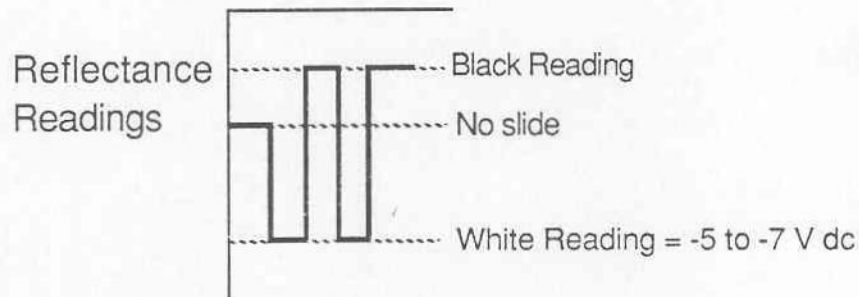
3. The CONTROLLER BOARD sends a signal to the ANALOG BOARD. The ANALOG BOARD sends a signal to the SLIDE TRANSPORT MOTOR to begin operation.
4. The SLIDE TRANSPORT MOTOR moves the SLIDE TRANSPORT CLIP from home position to the Pickup Station to engage the slide.
5. The CLIP moves the slide to the Hold Station, in one continual motion.
6. As the slide moves under the BAR CODE READER, the light reflected from the bar code is read.

7. The BAR CODE READER BOARD makes a series of electrical signals that correspond to the light reflected from the white and black lines in the bar code. The white lines reflect light, and the black lines do not. The adjustment procedure for the BAR CODE READER gives a uniform negative electrical value to the white lines. The length of the signals correspond to the thickness of the lines.

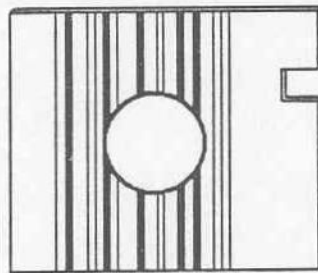
The following figure is a graphic description of a bar code conversion to an electrical signal. If you understand these fundamentals, you will be able to understand the adjustment for the BAR CODE READER.



Voltage signal for bar code:



8. Because of the position of the inserted slide, the bar code is read backward. The BAR CODE READER BOARD reverses the data to the correct sequence.
9. The BAR CODE READER BOARD sends a pulsing digital signal to the ANALOG BOARD. The signal is transferred to the CONTROLLER BOARD, and then a bus message is sent to the DT60 ANALYZER.
10. If no bar code data was sent, error code F32 occurs to indicate a possible slide jam at the Pickup Station.
11. The first 3 bars identify the slide as a rate slide. If only these bars are decoded, the message "SLIDE NOT IDENTIFIED / SELECT TEST" is displayed. The operator must manually select the test on the KEYBOARD.



These 3 bars identify rate slides.

12. If the slide was not inserted correctly, error code L19 will occur. The *DT60* ANALYZER sends a message to the *DTSC* MODULE that causes the slide to be returned to the Pickup Station.
13. Data is read from the CLM that checks if the chemistry of the slide is compatible with the data in the CLM. The chemistry of the slide must exist in the CLM, and the chemistry must be calibrated for the generation number of the slide.
14. If the chemistry is included in the CLM and is calibrated for the generation number, the *DT60* ANALYZER sends all data necessary for processing the slide to the *DTSC* MODULE. The name of the chemistry is displayed. The slide advances to the Spotting Station.
15. If the chemistry is not included in the CLM, or is not calibrated for the generation number of the slide, the message "SLIDE NOT VALID" is displayed. The *DT60* ANALYZER sends a message to the *DTSC* MODULE that causes the slide to be returned to the Pickup Station.

Slide Spotting System

Function

This section describes the operation of the SPOT DETECTOR SENSOR when fluid is dispensed on a slide.

Components

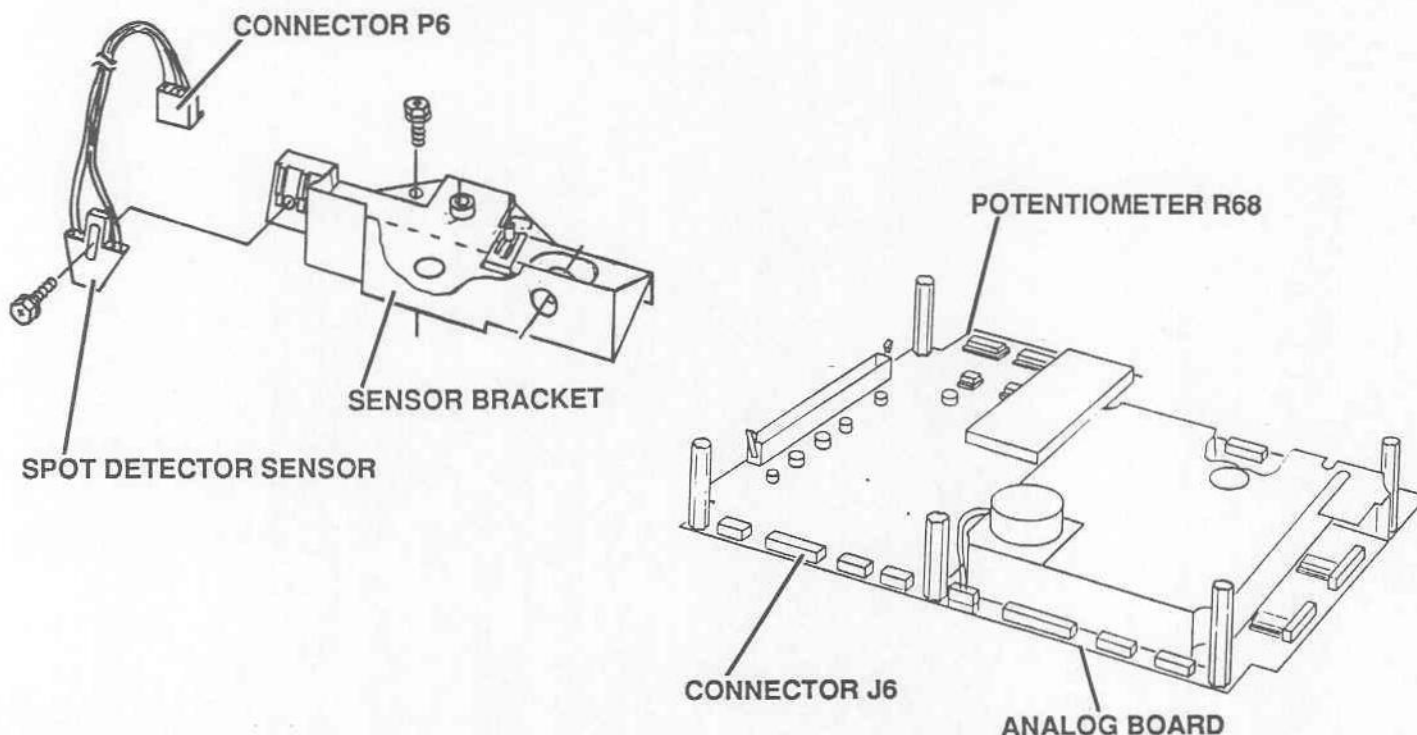
SPOT DETECTOR SENSOR

The SPOT DETECTOR SENSOR is fastened to the SENSOR BRACKET, which also holds the BAR CODE READER BOARD. The SPOT DETECTOR SENSOR has a Light Emitting Diode that projects a focused beam of light, and a Photo Diode that detects reflected light. When a slide is in the Spotting Station, the light is projected to the center of the slide, and the SPOT DETECTOR reads the light reflected from the surface of the slide.

CONNECTOR P6 provides data communication from the SPOT DETECTOR SENSOR to the ANALOG BOARD.

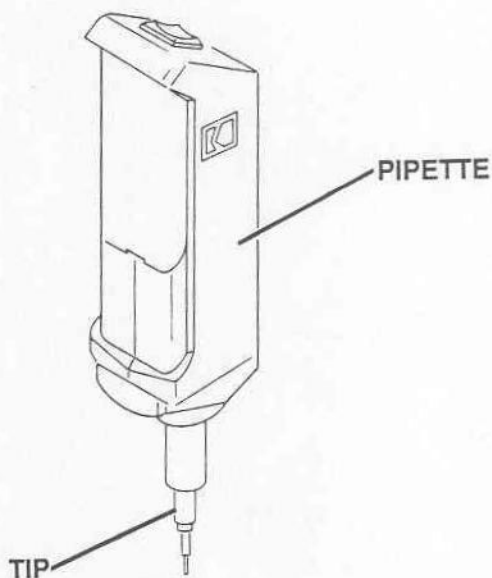
The function of the SPOT DETECTOR SENSOR is to detect the change of reflectance caused when a drop of fluid is dispensed on a slide. The SPOT DETECTOR SENSOR then executes a signal to continue the processing cycle of the slide. The SPOT DETECTOR SENSOR is energized continually, but the reading from the SPOT DETECTOR SENSOR is taken only when the slide is in the Spotting Station and ready to be spotted.

POTENTIOMETER R68 on the ANALOG BOARD adjusts the light output of the SPOT DETECTOR SENSOR.



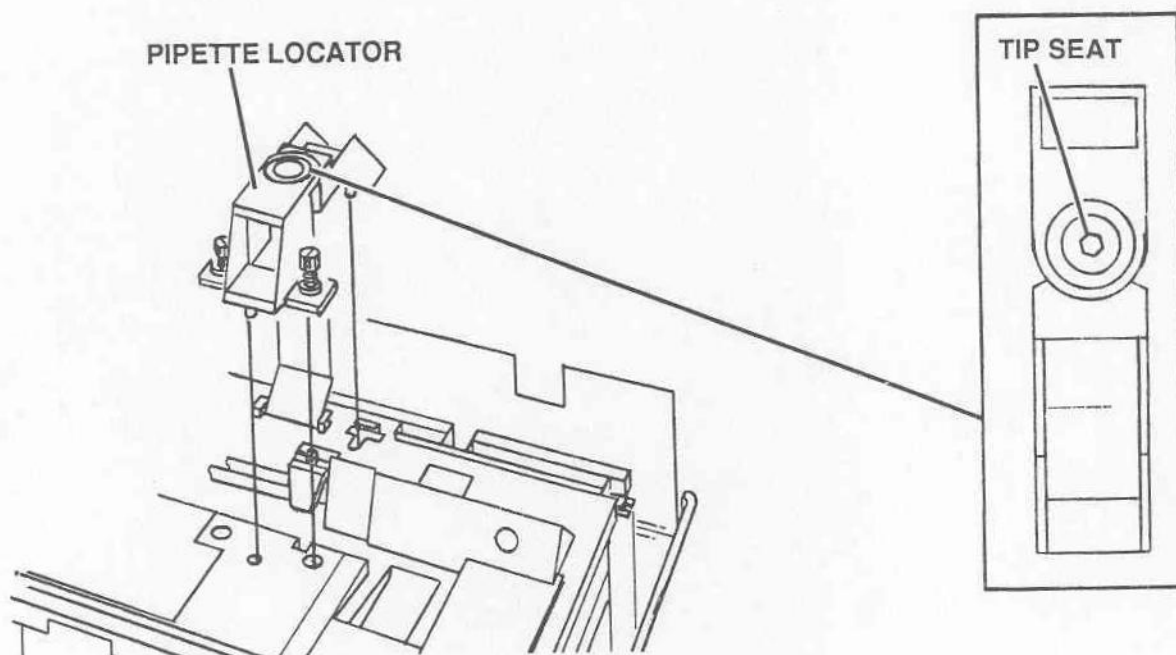
PIPETTE

A PIPETTE with disposable TIPS is used to aspirate and dispense fluids. The PIPETTE used with the DTSC MODULE is the same PIPETTE provided in Modification No. 2 for the DT60 ANALYZER. The Operator's Manual, and the videotape "Kodak Ektachem DT and DTE PIPETTE" have more information about the function and correct operation of PIPETTES.



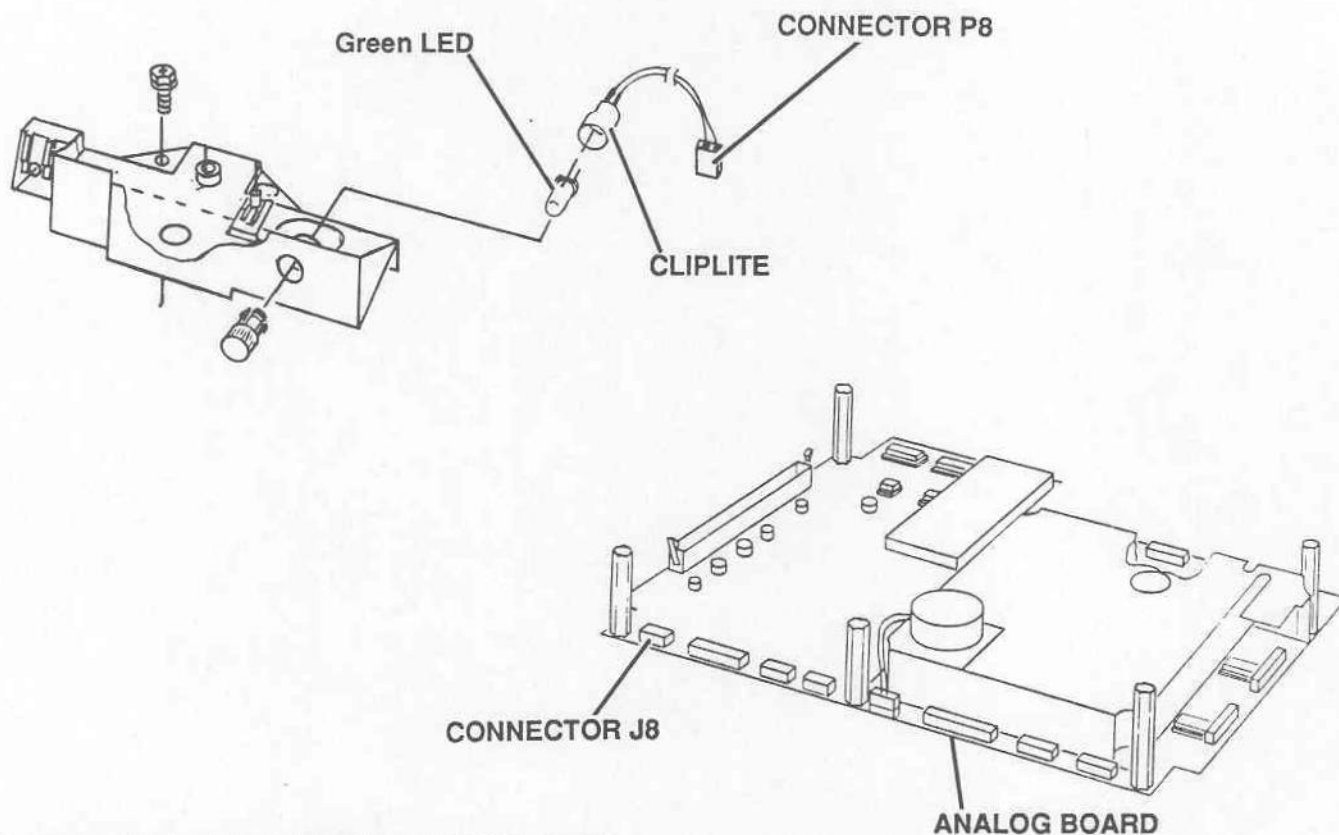
PIPETTE LOCATOR

The PIPETTE LOCATOR holds the inserted PIPETTE in the correct position so fluid can be dispensed with precision. The TIP SEAT in the PIPETTE LOCATOR must be adjusted correctly to dispense the 10 mL drop of fluid in the correct position on the slide.



Green LED

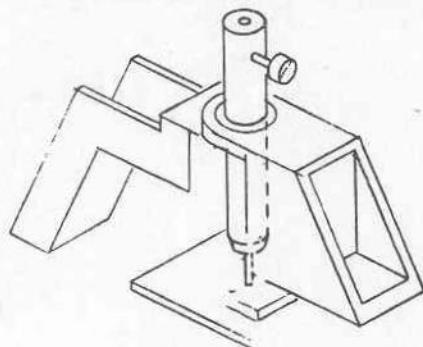
The green LED blinks to indicate to the operator when the slide is ready to receive the fluid from the PIPETTE. The CLIPLITE hold the LED. CONNECTOR P8 provides data communication to CONNECTOR J8 on the ANALOG BOARD to the LED.



TIP HEIGHT ADJUSTMENT GAUGE TL-3446

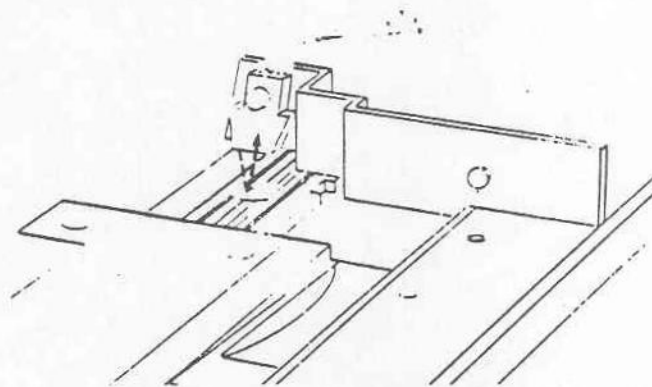
The TIP HEIGHT ADJUSTMENT GAUGE TL-3446 is used to check the distance from the slide to the TIP. If the distance is too short, the TIP could damage the slide, or the drop could adhere to the side of the TIP and not be dispensed on the slide. If the distance is too long, the drop might not be dispensed on the center of the slide. This tool is also used with the *DT60 ANALYZER*. The adjustment procedure has more information about using this tool.

TIP HEIGHT ADJUSTMENT GAUGE TL-3446

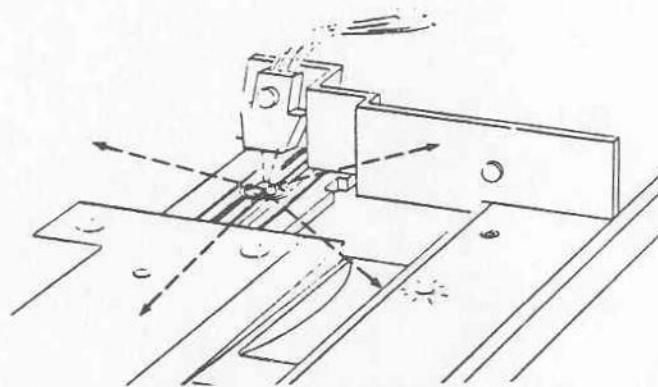


Sequence of Operation

1. Before the slide enters the Spotting Station, the green LED is not energized.
2. The motion of the slide to the Spotting Station is determined by step count signals to the SLIDE TRANSPORT MOTOR. The SPOT DETECTOR is energized continually, but does not monitor when a slide enters the Spotting Station. When a slide enters the Spotting Station, the reflectance from the surface of the slide is detected by the SPOT DETECTOR, but the SPOT DETECTOR does not execute a signal.
3. After the drive signal is sent, a 3 second delay occurs to allow the SPOT DETECTOR to stabilize. Then the ANALOG BOARD begins to monitor the reading from the SPOT DETECTOR SENSOR.
4. The green LED blinks and a tone occurs to indicate to the operator that the slide is ready to be spotted.
5. When the drop is dispensed, the reduced reflection to SPOT DETECTOR causes a signal to the ANALOG BOARD. The slide is ready to advance to the Wash Station.



No drop. Normal light reflectance



Drop on slide. Reduced light reflectance.

HALL EFFECT SENSORS

Function

The "Hall Effect" was first described by the physicist Edwin H. Hall. It is a description of the action of conductors in a magnetic field. A HALL EFFECT SENSOR is able to measure a short change in distance from a magnet, and to convert the distance to an analog signal. This section will describe the function of HALL EFFECT SENSORS in the DTSC MODULE.

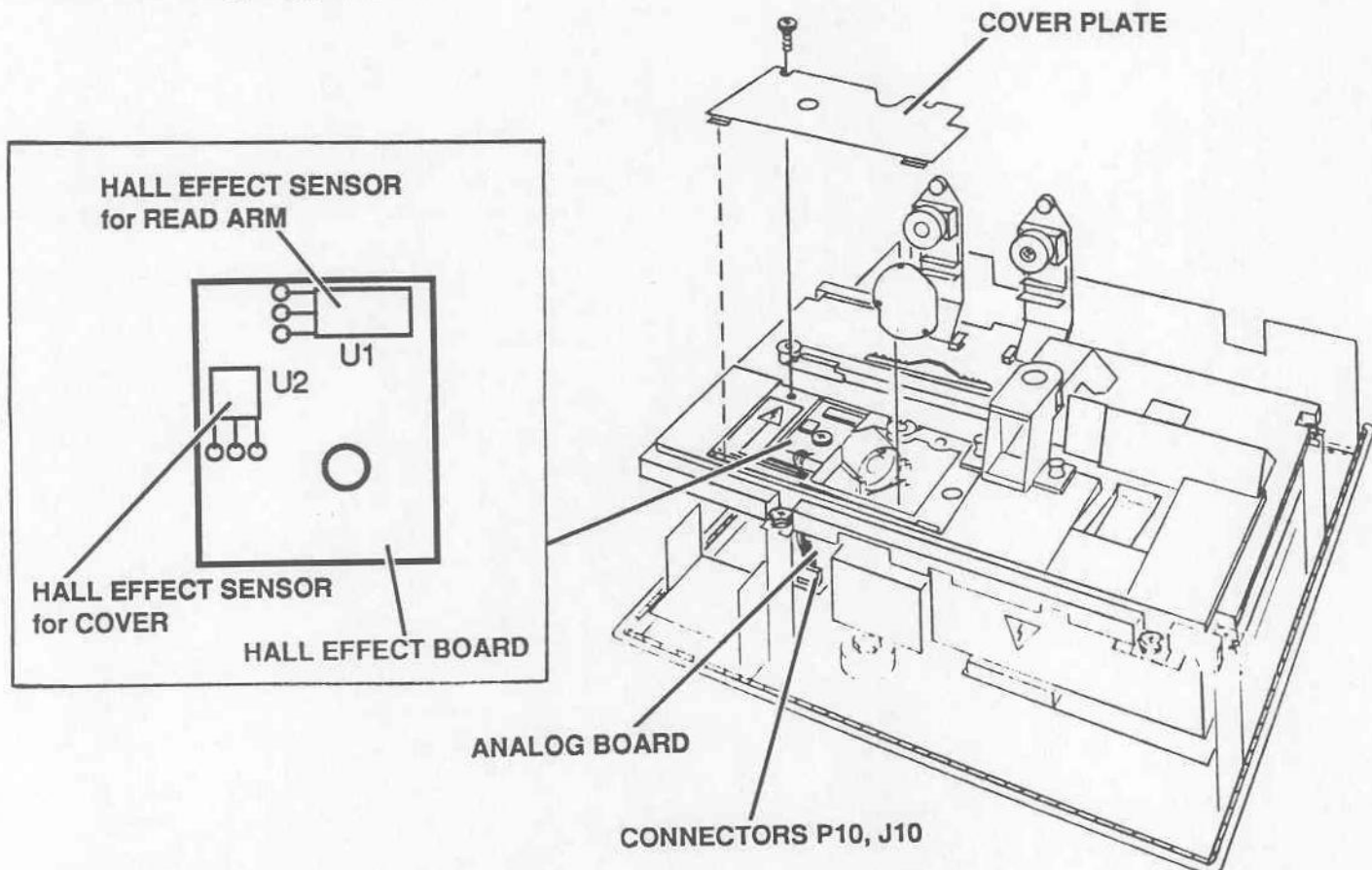
Components

HALL EFFECT SENSORS

2 HALL EFFECT SENSORS are located on the HALL EFFECT BOARD. One of the HALL EFFECT SENSORS monitors the position of the OPERATOR ACCESS COVER. The other HALL EFFECT SENSOR monitors the position of the READ ARM.

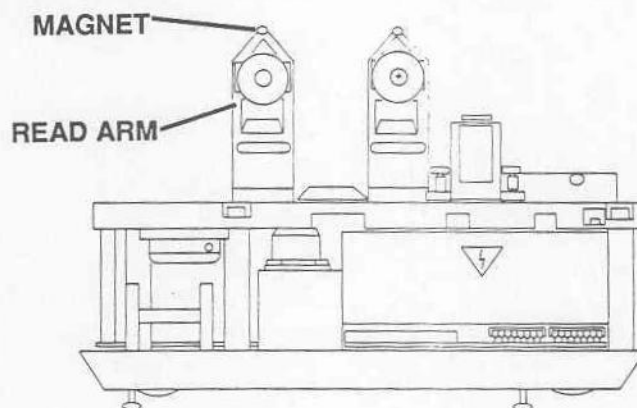
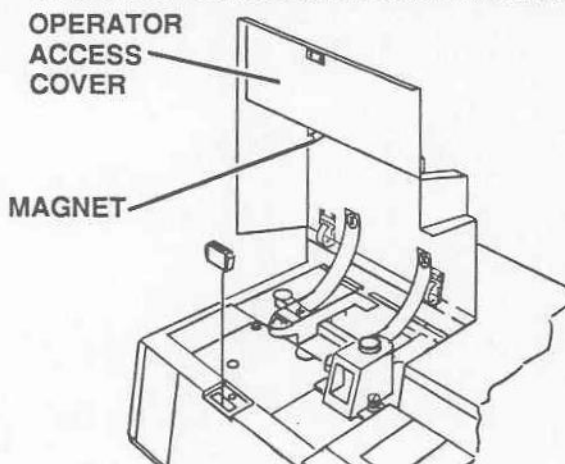
HALL EFFECT BOARD

The HALL EFFECT BOARD monitors the signals of the HALL EFFECT SENSORS and transfers the signals to the ANALOG BOARD. CONNECTOR P10 provides data communication to CONNECTOR J10 on the ANALOG BOARD. The COVER PLATE must be removed for access to the HALL EFFECT BOARD.



MAGNETS

2 permanent MAGNETS are used with the HALL EFFECT SENSORS. One MAGNET is in the OPERATOR ACCESS COVER. The other MAGNET is in the end of the READ ARM. For correct operation, the correct poles of the MAGNETS must be toward the HALL EFFECT SENSORS. If a MAGNET falls out of the component, do not install it if you cannot determine the original position. Install a new READ ARM or a new OPERATOR ACCESS COVER for replacement parts.



Operation

OPERATOR ACCESS COVER

When the OPERATOR ACCESS COVER is down, the HALL EFFECT SENSOR detects the MAGNET, and executes a signal. Error code L27 occurs if the HALL EFFECT SENSOR does not detect that the COVER is down when a test is being processed. Option 70 cancels the monitoring function.

READ ARM

The operation for the READ ARM is more complex. Any change in distance between the HALL EFFECT SENSOR and the MAGNET is measured as an exponential change. Because of this measurement, the HALL EFFECT SENSOR can detect short changes in distance from the MAGNET. The HALL EFFECT SENSOR should detect 3 positions for the READ ARM:

- when the READ ARM is down and no slide is at the Read Station, the voltage output should be 7.0 to 11.5 V dc
- when the READ ARM is down and a slide is in the Read Station, the voltage output should be 6.5 to 11.0 V dc
- when the READ ARM is fully up, the voltage output should be 4.5 to 8.0 V dc.

Error code F31 occurs when the HALL EFFECT SENSOR does not indicate that a slide is in the Read Station at the correct time.

Option 109 checks the operation of the HALL EFFECT SENSOR for the READ ARM.



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2/86

Kodak Ektachem DTSC MODULE

Section 4 Diagnostics

PLEASE NOTE

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• CAUTION •



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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* Not available in this advance copy. Will be included in the completed diagnostics procedures.

Error Codes

The diagnostic software in the DTSC MODULE monitors the operation of many components and systems. When an error condition is detected, the diagnostic software might display an error code or an error message indicating the malfunction. The error code could be displayed on the LC DISPLAY, on the printout, or on both. A short description of the malfunction is included with the error code.

Error codes may prevent the operator from continuing normal operation of the equipment. By stopping normal operation, the quality of the test results is protected. The error codes may do the following:

- Require the operator to do an operation again.
- Allow access only to the options.
- Initialize the equipment and start normal operation again.
- Report an error message instead of test results.
- Prevent any operation before the malfunction is repaired.

The Operator's Manual has instructions for the operator that explain what to do if an error code occurs. Normally, if this action does not correct the error code, or if the error code occurs frequently, the operator will order service. For some error codes, the Operator's Manual only instructs the operator to place a call for service immediately.

Error codes for the DTSC MODULE have a letter and a number. The letters correspond to the letters used for the error codes for the DT60 ANALYZER.

The "D" error codes, D25 to D28, indicate data storage malfunctions.

The "F" error codes, F30 to F33, indicate that the mechanical functions of a STEPPER MOTOR are wrong.

The "H" error codes, H16 to H19, indicate that the heating system has a malfunction.

The "L" error codes, L11 to L26, indicate that the operational limits are exceeded.

The "N" error codes, N11 to N17, indicate malfunctions for the data communications between the DTSC MODULE and the DT60 ANALYZER.

But it is important to understand that error codes might not be caused by the condition indicated in the error message. Because the software functions are complex and closely related, the diagnostic software could report a software malfunction as a hardware malfunction.

Error Messages

Not all error conditions have corresponding error codes. Some error messages occur without error codes, for example, the message "RESULTS ABOVE ANALYZER RANGE". The diagnostic procedures include instructions for these error messages, similar to the instructions for error codes.

Error Conditions Without Error Codes or Error Messages

Some error conditions have neither error codes nor error messages. For example, an operator might insert a slide in the Pickup Station, but no response occurs from the equipment, and no error code is executed. The diagnostic procedures include instructions for these error conditions, similar to the instructions for error codes.

Content of the Diagnostic Procedures

The following procedures will give you all the information necessary to diagnose and repair malfunctions in the Kodak Ektachem DTSC MODULE. The diagnostics section has 3 main parts:

- Error Code Tables about error codes
- Tables for error conditions that do not have error codes
- Checkout Procedures.

The Error Code Tables have the following information:

- The error code and error message, if any.
- A description of the error, giving information about normal operation of the related component or system, and the exact condition that executes the error code.
- A table that gives possible causes, and corresponding procedures for diagnosing and repairing the malfunction. The possible causes are listed together if they are similar. For example, one list might have operator errors, other lists might have problems related to each component in the system, and the last list might have malfunctions for external data communications.

The diagnostic procedures show corrective actions for each group of possible causes. This list might also refer you to the Checkout Procedures, which are described below.

- A parts list with most of the replacement parts that could be necessary for repairing the malfunction.
- A special tools list with special tools that are necessary to diagnose and repair the malfunction.
- A list of additional information resources about the malfunction.

The Checkout Procedures have all the necessary information for diagnosing and repairing each of the main components and systems in the DTSC MODULE. The Checkout Procedures will check for malfunctions in these areas:

- mechanical malfunctions of the system
- electrical and power distribution malfunctions
- malfunctions in the internal data communications that control the system.

To check the electrical and data operations, you might have to trace a special signal. The Error Code Tables indicate the component and TEST POINT used to diagnose the unique signal. The Checkout Procedure has instructions to enable access to the signals, and the indications of correct operation and errors.

Using Diagnostic Procedures to Repair Malfunctions

When possible, speak to the customer on the telephone before going to the site. Obtain information about:

- what the operator was doing when the error occurred
- if an error code was indicated
- the actions the operator did to correct the malfunction.

Some common operator errors are:

- slide not inserted correctly
- slide not identified correctly (Operator entered a slide type that was not correct, causing results "out of range")
- slides not warm before using
- PIPETTE not used correctly
- drop dispensed from PIPETTE before green LED flashes

The customer should recognize you as a qualified service specialist, and should recognize Kodak as a company that provides quality service.

Locate the error code and error condition in the diagnostics. Note the parts and special tools that might be necessary for the service call.

At the customer site, check normal operation to determine if the malfunction or error code occurs again. When you check normal operation, you will obtain more information about the malfunction.

Check for visible causes of a malfunction. The causes might include disconnected CONNECTORS, adjustments that are not correct, BOARDS that are not seated correctly, and SWITCHES that are not in the correct position. All this information is included in the Error Code Tables.

Use the diagnostics to trace the cause of the malfunction. Determine the necessary steps to repair the malfunction.

Check for correct operation before leaving the customer site.

Provide necessary information to SCAN, using the correct error code. Use the correct procedure for handling removed parts.

Malfunctions Related to Chemistry

If you are not qualified to handle questions about chemistries or test results, ask the customer to obtain information from the CPD Hotline. ESRs also have access to this information when they want it.

Malfunctions Related to the Customer Computer

If the customer is using a computer with the DT60 ANALYZER, data communication problems between the DT60 ANALYZER and the customer computer could occur. The diagnostic procedure will instruct you to check that the data is sent from the DT60 ANALYZER in a correct format. You will also check that the DT60 ANALYZER is able to receive data from the customer computer.

The service philosophy is that you should not try to diagnose or repair malfunctions in the data signals from the customer computer. Do the checkout and repair procedures for the DT60 ANALYZER, and if the malfunction continues to occur, instruct the customer to obtain service for the computer.

D25 - "DTSC INTERNAL RAM FAILURE"

Description

During initialization of the DTSC MODULE, the microprocessor, INTEGRATED CIRCUIT U4, does several checkouts of the memory. To check the internal RAM U4, the microprocessor retrieves the checkout pattern from PROM ASSEMBLY U1. Then the microprocessor writes the pattern to the internal RAM, reads the RAM, and makes a comparison. If the data in the RAM are not the same as the original data, error code D25 is displayed on the printout and initialization is stopped. If the error condition is an intermittent malfunction, a recovery might be possible by deenergizing, then energizing the DTSC MODULE.

NOTE

INTEGRATED CIRCUIT U4 and PROM ASSEMBLY U1 are on the CONTROLLER BOARD.

Special Tools

None

Possible Replacement Parts

CONTROLLER BOARD 351460

Additional Information

Diagrams
Parts/Removals

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE again. If error code D25 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
<ul style="list-style-type: none">- CONTROLLER BOARD does not transfer data correctly.- PROM ASSEMBLY U1 has the wrong checkout pattern- Microprocessor, U4- (internal RAM) does not retrieve data correctly.	<ul style="list-style-type: none">- Clear the software by moving the MAIN POWER SWITCH to "0", then "1".- Seat U1 and check again.- If necessary, install a new CONTROLLER BOARD 351460.

D26 - "DTSC EXTERNAL RAM FAILURE"

Description

During initialization of the DTSC MODULE, the microprocessor, INTEGRATED CIRCUIT U4, does several checkouts of the memory. To check the external RAMS U6 and U7, the microprocessor retrieves the checkout pattern from PROM ASSEMBLY U1. Then the microprocessor writes the pattern to the external RAM, reads the RAM, and makes a comparison. If the data in the RAM are not the same as the original data, error code D26 is displayed on the printout and initialization is stopped. If the error condition is an intermittent malfunction, a recovery might be possible by deenergizing, then energizing the DTSC MODULE.

NOTE

INTEGRATED CIRCUIT U4, external RAMS U6 and U7, and PROM ASSEMBLY U1 are on the CONTROLLER BOARD.

Special Tools

None

Possible Replacement Parts

CONTROLLER BOARD 351460

Additional Information

Diagrams
Parts/Removals

To Check for Correct Operation

To check that the malfunction is repaired, initialize the DTSC MODULE again. If error code D26 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
<ul style="list-style-type: none">- CONTROLLER BOARD does not transfer data correctly.- RAM U6 and U7 (external RAM) have damage.- The checkout pattern in PROM ASSEMBLY U1 has damage.- Microprocessor, U4 (internal RAM) does not retrieve data correctly.	<ul style="list-style-type: none">- Clear the software by moving the MAIN POWER SWITCH to "0", then "1".- Seat U1, U4, U6, and U7 and check again.- If necessary, install a new CONTROLLER BOARD 351460.

D27 -" DTSC BATTERY RAM FAILURE"

Description

The "BATTERY RAM" is NONVOLATILE RAM U5 on the CONTROLLER BOARD. The NONVOLATILE RAM U5 stores important information about the gains, the home positions for the SLIDE TRANSPORT CLIP, and the FILTER WHEEL. Each time the microprocessor, INTEGRATED CIRCUIT U4, writes to the NONVOLATILE RAM U5, a checkout procedure is done. After writing to the NONVOLATILE RAM U5, the microprocessor reads the data and makes a comparison with the original data. If the data in the NONVOLATILE RAM U5 are not the same as the original data, error code D27 is displayed on the printout and operation of the DTSC MODULE is stopped. If the error condition is an intermittent malfunction, a recovery might be possible by repeating the operation that was stopped when the error condition occurred.

Special Tools

None

Possible Replacement Parts

CONTROLLER BOARD 351460

Additional Information

Diagrams
Parts/Removals

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE again. If error code D27 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
<ul style="list-style-type: none">- CONTROLLER BOARD, malfunction- Microprocessor U4 (internal RAM) does not retrieve data correctly.- NONVOLATILE RAM U5 has a malfunction.	<ul style="list-style-type: none">- Clear the software by moving the MAIN POWER SWITCH to "0", then "1".- Seat U4 and U5 and check again.- If necessary, install a new CONTROLLER BOARD BOARD 351460.

D28 - "DTSC CHECKSUM FAILURE"

Description

During initialization of the DTSC MODULE, the microprocessor, INTEGRATED CIRCUIT U4 on the CONTROLLER BOARD, does several checkouts of the memory. To check the PROM ASSEMBLY U1, the microprocessor does a checksum procedure for the PROM ASSEMBLY and makes a comparison with the correct data stored in a special memory location. If the new checksum is not the same as the stored data, error code D28 is displayed on the printout and initialization is stopped. If the error condition is an intermittent malfunction, a recovery might be possible by deenergizing, then energizing the DTSC MODULE.

Special Tools

None

Possible Replacement Parts

CONTROLLER BOARD 351460

Additional Information

Diagrams

Parts/Removals

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE again. If error code D28 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
<ul style="list-style-type: none">- CONTROLLER BOARD, malfunction- Microprocessor, U4 (internal RAM) does not retrieve data correctly.- PROM ASSEMBLY U1 has a malfunction.	<ul style="list-style-type: none">- Clear the software by moving the MAIN POWER SWITCH to "0", then "1".- Seat U4 and U1 and check again.- If necessary, install a new CONTROLLER BOARD 351460.

F30 - "DTSC TRANSFER MALFUNCTION"

F31 - "SLIDE NOT AT READ STATION"

Description

After the DROP SENSOR detects a change in voltage indicating that a drop was dispensed, the software program monitors the drive signals for the SLIDE TRANSPORT MOTOR. First the slide is moved to the Preheat Station to become warm. During the time in the Preheat Station, the REFLECTOMETER makes 3 reference readings. The SLIDE TRANSPORT MOTOR starts again and should move to place the slide in the Read Station. Then the software program expects the HALL EFFECT SENSOR to execute a voltage signal of 10.0 to 10.5 V dc as an indication that the READ ARM is in a down position on a slide. If the voltage is not correct when a slide is expected in the Read Station, error code F31 is displayed on the printout.

Error code F30 only indicates that the transfer malfunction is for the DTSC MODULE.

Special Tools

PUSH-PULL SCALE TL-1079
TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts

SLIDE TRANSPORT CLIP 351666
PREHEAT PLATEN ASSEMBLY 351566
PIPETTE LOCATOR 351567
SLIDE TRANSPORT BELT 351474
SLIDE TRANSPORT MOTOR/GEAR ASSEMBLY 351588
SLIDER CAM 351441
CAM MOTOR DRIVE/GEAR ASSEMBLY
READ ARM AND HEATER ASSEMBLY (MAGNET) 351575
READ ARM SPRING 351684
HALL-EFFECT SENSOR BOARD 351464
ANALOG BOARD 351461
INTEGRATED CIRCUIT PROM U7 337444 on ANALOG BOARD
INTEGRATED CIRCUIT PROM U1 337444 on ANALOG BOARD
CONTROLLER BOARD 351460

Additional Information

Normal Operation - Slide Transport System and Slide Reading
Diagrams
Parts/Removals

To Check for Correct Operation:

To check that the malfunction is repaired, operate the DTSC MODULE with a slide. If error code F31 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
<ul style="list-style-type: none"> - Operator removed slide after BAR CODE was read. - Slide is not flat. 	<ul style="list-style-type: none"> - Start the test again using another slide.
<ul style="list-style-type: none"> - ARM SPRING on READ ARM, malfunction or damage 	<ul style="list-style-type: none"> - Install SPRING correctly, or install replacement part.
<ul style="list-style-type: none"> - Slide jam between Spotting Station and Read Station - SLIDE CLIP, malfunction or damage - Obstruction in slide path - Broken STAGING RAMP on PREHEAT PLATEN ASSEMBLY or PIPETTE LOCATOR - SLIDE CAM, broken or malfunction - SLIDE TRANSPORT BELT, malfunction, damage, or needs tension adjustment 	<ul style="list-style-type: none"> - Check for and clear slide jam. - Use options 108 and 107 and do Checkout Procedure for the Slide Transport System. - Check tension adjustment for SLIDE TRANSPORT BELT using TL-1079. The tension should be 2.5 to 3.5 oz with BELT compressed.

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, operate the DTSC MODULE with a slide. If error code F31 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																					
<ul style="list-style-type: none"> - SLIDE TRANSPORT MOTOR/PULLEY ASSEMBLY, malfunction - DRIVER PROM U7 on ANALOG BOARD has damage. - CONTROLLER BOARD does not give correct drive signals for SLIDE TRANSPORT MOTOR. 	<ul style="list-style-type: none"> - Check SLIDE TRANSPORT MOTOR operation. See Checkout Procedure for STEPPER MOTORS. Impedance for MOTOR should be: <table border="1"> <thead> <tr> <th colspan="3">TL-3424</th> </tr> <tr> <th>Location</th> <th>Connection</th> <th>Impedance</th> </tr> </thead> <tbody> <tr> <td>MOTOR</td> <td>P11- SOCKETS 2 and 3</td> <td>150 ohms</td> </tr> <tr> <td>MOTOR</td> <td>P11- SOCKETS 5 and 6</td> <td>150 ohms</td> </tr> </tbody> </table> - Check drive signals from CONTROLLER BOARD during option 108: <table border="1"> <thead> <tr> <th colspan="3">TL-3577, TL-3624, TL-3008</th> </tr> <tr> <th>Location</th> <th>Connection</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>TL-3577</td> <td>PINS 39 to 42</td> <td>All pulse</td> </tr> </tbody> </table> 	TL-3424			Location	Connection	Impedance	MOTOR	P11- SOCKETS 2 and 3	150 ohms	MOTOR	P11- SOCKETS 5 and 6	150 ohms	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PINS 39 to 42	All pulse
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TL-3577, TL-3624, TL-3008																						
Location	Connection	Signal																				
TL-3577	PINS 39 to 42	All pulse																				
<ul style="list-style-type: none"> - CAM MOTOR DRIVE/PULLEY ASSEMBLY, malfunction or damage - DRIVER PROM U1 on ANALOG BOARD has damage. - CONTROLLER BOARD does not give correct drive signals for CAM DRIVE MOTOR. 	<ul style="list-style-type: none"> - Check CAM DRIVE MOTOR operation. See Checkout Procedure for STEPPER MOTORS. Impedance for MOTOR should be: <table border="1"> <thead> <tr> <th colspan="3">MULTIMETER TL-3424</th> </tr> <tr> <th>Location</th> <th>Connection</th> <th>Impedance</th> </tr> </thead> <tbody> <tr> <td>MOTOR</td> <td>P12- SOCKETS 5 and 6</td> <td>150 ohms</td> </tr> <tr> <td>MOTOR</td> <td>P12- SOCKETS 2 and 3</td> <td>150 ohms</td> </tr> </tbody> </table> - Check drive signals from CONTROLLER BOARD during option 111. <table border="1"> <thead> <tr> <th colspan="3">TL-3577, TL-3624, TL-3008</th> </tr> <tr> <th>Location</th> <th>Connection</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>TL-3577</td> <td>PINS 35 to 38</td> <td>All pulse</td> </tr> </tbody> </table> 	MULTIMETER TL-3424			Location	Connection	Impedance	MOTOR	P12- SOCKETS 5 and 6	150 ohms	MOTOR	P12- SOCKETS 2 and 3	150 ohms	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PINS 35 to 38	All pulse
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Location	Connection	Signal																				
TL-3577	PINS 35 to 38	All pulse																				

To Check for Correct Operation:

To check that the malfunction is repaired, operate the DTSC MODULE with a slide. If error code F31 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																								
<p>Malfunctions related to HALL EFFECT BOARD:</p> <ul style="list-style-type: none">- MAGNET or READ ARM, malfunction or damage- FLASH COVER PLATE, HALL-EFFECT BOARD, or CONNECTOR J10, not installed correctly- HALL-EFFECT SENSOR BOARD, malfunction of the READ ARM SENSOR <p>- CONTROLLER BOARD, malfunction of +15 V dc signal</p> <p>- ANALOG BOARD, malfunction of A/D CONVERTER</p> <p>- ANALOG BOARD, malfunction in signal from HALL-EFFECT SENSOR BOARD</p> <p>- HALL-EFFECT SENSOR BOARD, malfunction in signal from READ ARM SENSOR</p>	<ul style="list-style-type: none">- Do Checkout Procedure for the HALL-EFFECT READ ARM SENSOR:<ul style="list-style-type: none">- Check for damage and malfunctions, and check the installation of visible parts.- Use option 109 with a slide in the Read Station and the READ ARM down. Check the printout for a change in A/D units between positions of the READ ARM. If A/D units are correct, READ ARM SENSOR is correct.- Check dc voltage with a slide in the Read Station and the READ ARM down. <table border="1"><thead><tr><th colspan="4">TL-3577, TL-3624, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr></thead><tbody><tr><td>TL-3577</td><td>TP 17</td><td>TP15</td><td>10.25 V dc</td></tr></tbody></table> <p>Check voltage with slide in Read Station.</p> <table border="1"><thead><tr><th colspan="4">TL-3424</th></tr><tr><th>BOARD</th><th>+</th><th>Ground</th><th>Signal</th></tr></thead><tbody><tr><td>ANALOG</td><td>J10-6</td><td>TP7</td><td>10.25 V dc</td></tr></tbody></table>	TL-3577, TL-3624, TL-3424				Location	+	Ground	Voltage	TL-3577	TP 17	TP15	10.25 V dc	TL-3424				BOARD	+	Ground	Signal	ANALOG	J10-6	TP7	10.25 V dc
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ANALOG	J10-6	TP7	10.25 V dc																						

F30 - "DTSC TRANSFER MALFUNCTION" F32 - "SLIDE NOT AT BARCODE STATION"

Description

The "BARCODE STATION" is the Hold Station. The BAR CODE READER is continually energized, causing a light beam to be focused through a LENS onto the SLIDE TRACK. A PHOTO DIODE in the BAR CODE READER detects any light reflected backward through another LENS. The PHOTO DIODE sends to the ANALOG BOARD a voltage signal corresponding to the quantity of light received. This voltage is monitored by the microprocessor on the CONTROLLER BOARD. When no slide is under the BAR CODE READER, the PHOTO DIODE detects no reflected light beam. When a slide is inserted at the Pickup Station, the light beam is reflected from the white edge of the slide through the LENS to the PHOTO DIODE. The voltage changes to -5 to -7 V dc. The signal is converted to a digital value on the ANALOG BOARD. Then the digital signal continues to the CONTROLLER BOARD. The microprocessor on the CONTROLLER BOARD sends a drive signal to U7 on the ANALOG BOARD to start the SLIDE TRANSPORT MOTOR. The SLIDE TRANSPORT CLIP engages the slide. A series of voltage changes occur as the bar code is read. Then the microprocessor expects another voltage change as an indication that the edge of the slide has cleared the BAR CODE READER. If the voltage does not change, error code F32 is executed. "DTSC NOT READY" is displayed in the LC DISPLAY and the SLIDE TRANSPORT MOTOR is reversed to move the slide backward to the Pickup Station for operator action.

Error code F30 only indicates that the transfer malfunction is for the DTSC MODULE.

Special Tools: SPRING SCALE TL-1U79

Possible Adjustments:

SLIDE TRANSPORT BELT - Tension

Possible Replacement Parts:

ANALOG BOARD 351461
PROGRAMMED ROM U7 337444 ["Driver Chip" for SLIDE TRANSPORT MOTOR]
SLIDE TRANSPORT MOTOR/GEAR ASSEMBLY 351588
SLIDE TRANSPORT CLIP 351666
SLIDE TRANSPORT BELT 351474
CONTROLLER BOARD 351460

To Check for Correct Operation:

To check that the malfunction is repaired, operate the DTSC MODULE with a slide. If error code F32 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions												
- Slide was not inserted correctly.	- The operator should insert the slide again.												
- Slide jam before slide reaches Hold Station. - SLIDE TRANSFER CLIP does not engage the slide. - The SLIDE TRANSPORT BELT tension is not correct. - Obstruction in slide path	- Check for and clear the slide jam. - Use option 107 and do the Checkout Procedure for the Slide Transport System. Check the adjustment for SLIDE TRANSPORT BELT - Tension												
- SLIDE TRANSPORT MOTOR does not move the BELT correctly. - The drive signal to the SLIDE TRANSPORT MOTOR is not correct. - CONNECTOR J11 is loose.	- Do the Checkout Procedure for the STEPPER MOTOR and check the signals for the SLIDE TRANSPORT MOTOR: - Seat CONNECTOR J11 on ANALOG BOARD - Use MULTIMETER TL-3424 and check impedance: <table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>MOTOR</td><td>P11- SOCKETS 2 and 3</td><td>150 ohms</td></tr><tr><td>MOTOR</td><td>P11- SOCKETS 5 and 6</td><td>150 ohms</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	MOTOR	P11- SOCKETS 2 and 3	150 ohms	MOTOR	P11- SOCKETS 5 and 6	150 ohms
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MOTOR	P11- SOCKETS 2 and 3	150 ohms											
MOTOR	P11- SOCKETS 5 and 6	150 ohms											
- The drive signal from U7 on the CONTROLLER BOARD is not correct.	- Seat CONNECTOR J9 to the CONTROLLER BOARD. - Use option 108 and check the drive signal: <table><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td>TL-3577</td><td>PINS 39 to 42</td><td>All pulse</td></tr></table>	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PINS 39 to 42	All pulse			
TL-3577, TL-3624, TL-3008													
Location	Connection	Signal											
TL-3577	PINS 39 to 42	All pulse											

F30 - "DTSC TRANSFER MALFUNCTION" F33 - "DTSC FILTER POSITION ERROR"

Description

Home-position for the FILTER WHEEL is at the 340 nm filter, in filter position 0. The FILTER WHEEL cannot detect the position of each filter. Each filter position is determined by moving the FILTER WHEEL a number of steps from home-position. It is important that the FILTER WHEEL be at home-position so that the correct filters will be selected when necessary.

To move to home-position, first the dark reading at filter position 9 (the BLACK PLUG in the FILTER WHEEL) and then the light reading at filter position 0 (the 340 nm filter) are checked. If the readings for these 2 positions are not correct, error code F33 occurs.

In normal operation, the software in the DTSC MODULE checks that the FILTER WHEEL is at home-position during the following operations:

- During initialization, before the ANALYZER reaches operating temperature. A minimum of 7 flashes is necessary to complete the search function through the filter edge.
- During initialization, after the gain calculations. This operation checks that the correct filter was used for the gain readings. If home-position is not detected, no gains are calculated.
- During Run Mode, after all readings for a slide are completed. This operation checks that the correct filter was used for the readings. If home-position is not detected, no test results are given.
- After options 105 or 106 are executed and the Option Mode is cancelled. These options can move the FILTER WHEEL, and home-position must be detected before normal operation can continue.

If the readings for filter positions 9 and 0 do not indicate that the FILTER WHEEL is in home-position, error code F33 occurs.

Error code F30 only indicates that transfer malfunction is in the DTSC MODULE.

Special Tools: TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts:

FILTER WHEEL ENCLOSURE ASSEMBLY 351516	FLASH LAMP 337379
READ ARM AND HEATER ASSEMBLY 351678	FUSE 351571
REFLECTOMETER ASSEMBLY 351670	FUSE 337488
ANALOG BOARD 351461	CONTROLLER BOARD 351460
FLASH ASSEMBLY 351571	INTEGRATED CIRCUIT J13 on ANALOG BOARD 357444

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. If error code F33 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																				
<ul style="list-style-type: none">- Flash System has a malfunction:<ul style="list-style-type: none">- FLASH LAMP needs replacement.- FLASH ASSEMBLY or FUSE F1 need replacement.- CONNECTOR J4 to the FLASH ASSEMBLY is loose or has damage.- The flash signal from the CONTROLLER BOARD is not correct.- The flash power supply has a malfunction. FUSES F1, F3, or F4 could need replacement.	<ul style="list-style-type: none">- Move MAIN POWER SWITCH up and check if flashes occur.- Do the Checkout Procedure for Flash System. If necessary, check the flash signals:<table><tr><th colspan="4">MULTIMETER TL-3424</th></tr><tr><th>BOARD</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>CONTROLLER J4-1</td><td>E3 or TP4</td><td>+5 V dc</td><td></td></tr><tr><td>CONTROLLER J4-2</td><td>E3 or TP4</td><td>12 V ac</td><td></td></tr><tr><td>CONTROLLER J4-3</td><td>E3 or TP4</td><td>12 V ac</td><td></td></tr></table>- Install new FUSES if necessary.	MULTIMETER TL-3424				BOARD	+	Ground	Voltage	CONTROLLER J4-1	E3 or TP4	+5 V dc		CONTROLLER J4-2	E3 or TP4	12 V ac		CONTROLLER J4-3	E3 or TP4	12 V ac	
MULTIMETER TL-3424																					
BOARD	+	Ground	Voltage																		
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CONTROLLER J4-2	E3 or TP4	12 V ac																			
CONTROLLER J4-3	E3 or TP4	12 V ac																			
<ul style="list-style-type: none">- REFLECTOMETER ASSEMBLY has damage.- Optics dirty or damaged: WHITE REFERENCE SAPPHIRE WINDOW	<ul style="list-style-type: none">- Do Checkout Procedure for REFLECTOMETER ASSEMBLY and Optics System.																				
<ul style="list-style-type: none">- The BELT in the FILTER WHEEL ASSEMBLY has binds or is loose.- Filters are dirty or missing.	<ul style="list-style-type: none">- Do the Checkout Procedure for FILTER WHEEL ASSEMBLY.																				
<ul style="list-style-type: none">- The PHOTO DIODES on the ANALOG BOARD do not detect the flashes.	<ul style="list-style-type: none">- Install a new ANALOG BOARD.																				

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE.
If error code F33 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions												
<ul style="list-style-type: none">- The drive signals to the FILTER WHEEL MOTOR have a malfunction:<ul style="list-style-type: none">- CONNECTOR P4 is loose.- The MOTOR is damaged.	<ul style="list-style-type: none">- Do the Checkout Procedure for STEPPER MOTORS and check the FILTER WHEEL MOTOR:<ul style="list-style-type: none">- Seat CONNECTOR P4.- Check MOTOR impedance: <table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>FILTER WHEEL MOTOR</td><td>P4 - SOCKETS 1 and 2</td><td>150 ohms</td></tr><tr><td></td><td>P4 - SOCKETS 4 and 5</td><td>150 ohms</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	FILTER WHEEL MOTOR	P4 - SOCKETS 1 and 2	150 ohms		P4 - SOCKETS 4 and 5	150 ohms
MULTIMETER TL-3424													
Location	Connection	Impedance											
FILTER WHEEL MOTOR	P4 - SOCKETS 1 and 2	150 ohms											
	P4 - SOCKETS 4 and 5	150 ohms											
<ul style="list-style-type: none">- The drive signals to the MOTOR are not correct.	<ul style="list-style-type: none">- Energize MAIN POWER SWITCH and check the drive signals:<ul style="list-style-type: none">- Configuration 1 ANALOG BOARD <table><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td>TL-3577</td><td>PINS 1 to 4</td><td>All pulse</td></tr></table> <ul style="list-style-type: none">- Configuration 2 ANALOG BOARD: LED DS8 on ANALOG BOARD energized	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PINS 1 to 4	All pulse			
TL-3577, TL-3624, TL-3008													
Location	Connection	Signal											
TL-3577	PINS 1 to 4	All pulse											
<ul style="list-style-type: none">- The NONVOLATILE RAM U5 does not store the filter phase positions correctly	<ul style="list-style-type: none">- Execute option 112 to clear NONVOLATILE RAM.- Do the Correction Factors Procedure.- Process slides with CONTROLS for all rate chemistries to check the coefficients in the NONVOLATILE RAM in the DT60 ANALYZER.- If the malfunction is not now repaired, install a new CONTROLLER BOARD.												

H16 - "DTSC PREHEAT CAP" "TOO LOW"

Description

The software continually monitors the temperature of the CONTROL THERMISTORS that operate the 4 HEATERS:

- "PREHEAT CAP" is the HEATER in the PREHEAT ARM
- "PREHEAT BOTTOM" is the HEATER in the PLATEN below the PREHEAT ARM
- "READ CAP" is the HEATER in the READ ARM
- "READ BOTTOM" is the HEATER in the PLATEN below the READ ARM.

If the readings indicate that the temperature in the PREHEAT ARM is below 36.8° C (98.2° F) error code H16 occurs with the message "TOO LOW".

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts

PREHEAT ARM AND HEATER ASSEMBLY 351566
FAN ASSEMBLY 351491
FUSE 337490
ANALOG BOARD 351461
CONTROLLER BOARD 351460

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H16 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions												
<ul style="list-style-type: none">- Temperature/humidity at the site is not within site specifications.	<ul style="list-style-type: none">- Check Site Specifications.												
<ul style="list-style-type: none">- CONNECTOR P5 is loose or has damage.- HEATER has damage	<ul style="list-style-type: none">- Do the Checkout Procedure for Temperature Too Low:<ul style="list-style-type: none">- Seat CONNECTOR P5 on ANALOG BOARD.- Check impedance of HEATER at CONNECTOR P5:<table border="1"><thead><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr></thead><tbody><tr><td>PREHEAT</td><td>P5 - SOCKETS</td><td>less than</td></tr><tr><td>ARM</td><td>1 and 2</td><td>100 ohms</td></tr></tbody></table>	MULTIMETER TL-3424			Location	Connection	Impedance	PREHEAT	P5 - SOCKETS	less than	ARM	1 and 2	100 ohms
MULTIMETER TL-3424													
Location	Connection	Impedance											
PREHEAT	P5 - SOCKETS	less than											
ARM	1 and 2	100 ohms											
<ul style="list-style-type: none">- FUSES have damage.	<ul style="list-style-type: none">- Check FUSES F2 and F5 on CONTROLLER BOARD.												
<ul style="list-style-type: none">- CONTROL THERMISTOR has a malfunction.	<ul style="list-style-type: none">- Check impedance of CONTROL THERMISTOR:<table border="1"><thead><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr></thead><tbody><tr><td>PREHEAT</td><td>P5 - SOCKETS</td><td>10 K ohms warm,</td></tr><tr><td>ARM</td><td>4 and 5</td><td>16.2 K ohms cold</td></tr></tbody></table>	MULTIMETER TL-3424			Location	Connection	Impedance	PREHEAT	P5 - SOCKETS	10 K ohms warm,	ARM	4 and 5	16.2 K ohms cold
MULTIMETER TL-3424													
Location	Connection	Impedance											
PREHEAT	P5 - SOCKETS	10 K ohms warm,											
ARM	4 and 5	16.2 K ohms cold											
<ul style="list-style-type: none">- Drive signal to HEATER not correct.	<ul style="list-style-type: none">- Check the drive signal:<table border="1"><thead><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr></thead><tbody><tr><td>TL-3577</td><td>PIN 10</td><td>Pulse</td></tr></tbody></table>	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PIN 10	Pulse			
TL-3577, TL-3624, TL-3008													
Location	Connection	Signal											
TL-3577	PIN 10	Pulse											

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H16 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions												
<p>- The power supply to the HEATER or THERMISTOR has a malfunction.</p>	<p>- See the Checkout Procedure for Temperature Too High and check the +14 V power supply:</p> <table><tr><th colspan="4">TL-3577, TL-3624, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>TL-3577</td><td>PIN 7 or 8</td><td>PIN 5 or 6</td><td>+14 V dc</td></tr></table>	TL-3577, TL-3624, TL-3424				Location	+	Ground	Voltage	TL-3577	PIN 7 or 8	PIN 5 or 6	+14 V dc
TL-3577, TL-3624, TL-3424													
Location	+	Ground	Voltage										
TL-3577	PIN 7 or 8	PIN 5 or 6	+14 V dc										

H16 - "DTSC PREHEAT CAP" "TOO HIGH"

Description

The software continually monitors the temperature of the CONTROL THERMISTORS that operate the 4 HEATERS:

- "PREHEAT CAP" is the HEATER in the PREHEAT ARM
- "PREHEAT BOTTOM" is the HEATER in the PLATEN below the PREHEAT ARM
- "READ CAP" is the HEATER in the READ ARM
- "READ BOTTOM" is the HEATER in the PLATEN below the READ ARM.

If the readings indicate that the temperature in the PREHEAT ARM is above 37.2° C (98.9° F) error code H16 occurs with the message "TOO HIGH".

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts

PREHEAT ARM AND HEATER ASSEMBLY 351566
FAN ASSEMBLY 351491
FUSE 357488
ANALOG BOARD 351461
CONTROLLER BOARD 351460

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H16 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions									
<ul style="list-style-type: none">- Temperature/humidity at the site is not within site specifications.- The FAN does not operate correctly.- The FUSES F3 and F4 for the FAN need replacement.	<ul style="list-style-type: none">- Check Site Specifications.- Do Checkout Procedure for Temperature Too Low. To check operation of the FAN:<ul style="list-style-type: none">- Replace FUSES F3 and F4 on the CONTROLLER BOARD if necessary.- Seat CONNECTOR P6 on CONTROLLER BOARD.- Check voltage:									
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>BOARD</th><th>Connection</th><th>Voltage</th></tr><tr><td>CONTROLLER</td><td>J6 - PINS 1 and 2</td><td>+12 V dc</td></tr></table>	MULTIMETER TL-3424			BOARD	Connection	Voltage	CONTROLLER	J6 - PINS 1 and 2	+12 V dc
MULTIMETER TL-3424										
BOARD	Connection	Voltage								
CONTROLLER	J6 - PINS 1 and 2	+12 V dc								
<ul style="list-style-type: none">- CONNECTOR P5 is loose or has damage.	<ul style="list-style-type: none">- Seat CONNECTOR P5- Check impedance of CONNECTOR P5:									
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>PREHEAT ARM</td><td>P5 - PINS 1 and 2</td><td>less than 100 ohms</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	PREHEAT ARM	P5 - PINS 1 and 2	less than 100 ohms
MULTIMETER TL-3424										
Location	Connection	Impedance								
PREHEAT ARM	P5 - PINS 1 and 2	less than 100 ohms								
<ul style="list-style-type: none">- CONTROL THERMISTOR has a malfunction.	<ul style="list-style-type: none">- Check impedance of CONTROL THERMISTOR:									
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>PREHEAT ARM</td><td>P5 - SOCKETS 4 and 5</td><td>10 K ohms warm, 6.2 K ohms cold</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	PREHEAT ARM	P5 - SOCKETS 4 and 5	10 K ohms warm, 6.2 K ohms cold
MULTIMETER TL-3424										
Location	Connection	Impedance								
PREHEAT ARM	P5 - SOCKETS 4 and 5	10 K ohms warm, 6.2 K ohms cold								

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H16 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions									
<p>- The drive signal to the HEATER does not deenergize when it should.</p>	<table><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td>TL-3577</td><td>PIN 10</td><td>See note</td></tr></table>	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PIN 10	See note
TL-3577, TL-3624, TL-3008										
Location	Connection	Signal								
TL-3577	PIN 10	See note								
	<p>NOTE</p> <p>If the signal does not pulse but is energized continually, install a new CONTROLLER BOARD.</p> <p>If the signal flickers, install a new ANALOG BOARD.</p>									

H17 - "DTSC PREHEAT BOTTOM" "TOO LOW"

Description

The software continually monitors the temperature of the CONTROL THERMISTORS that operate the 4 HEATERS:

- "PREHEAT CAP" is the HEATER in the PREHEAT ARM
- "PREHEAT BOTTOM" is the HEATER in the PLATEN below the PREHEAT ARM
- "READ CAP" is the HEATER in the READ ARM
- "READ BOTTOM" is the HEATER in the PLATEN below the READ ARM.

If the readings indicate that the temperature in the PREHEAT PLATEN is below 36.8° C (98.2° F) error code H17 occurs with the message "TOO LOW".

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts

PREHEAT PLATEN ASSEMBLY 351566
ANALOG BOARD 351461
CONTROLLER BOARD 351460
FUSE 337490

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H17 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions															
<ul style="list-style-type: none">- Temperature/humidity at the site is not within site specifications.	<ul style="list-style-type: none">- Check Site Specifications.															
<ul style="list-style-type: none">- CONNECTOR P3 is loose or has damage.- HEATER has damage.	<ul style="list-style-type: none">- Do the Checkout Procedure for Temperature Too Low:<ul style="list-style-type: none">- Seat CONNECTOR P3 on ANALOG BOARD.- Check impedance of HEATER at CONNECTOR P3:															
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td colspan="3">-----</td></tr><tr><td>PREHEAT/P3 - SOCKETS</td><td></td><td>less than</td></tr><tr><td>PLATEN</td><td>9 and 11</td><td>100 ohms</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	-----			PREHEAT/P3 - SOCKETS		less than	PLATEN	9 and 11	100 ohms
MULTIMETER TL-3424																
Location	Connection	Impedance														

PREHEAT/P3 - SOCKETS		less than														
PLATEN	9 and 11	100 ohms														
<ul style="list-style-type: none">- FUSES have damage.	<ul style="list-style-type: none">- Check FUSES F2 and F5 on CONTROLLER BOARD.															
<ul style="list-style-type: none">- CONTROL THERMISTOR has a malfunction.	<ul style="list-style-type: none">- Check impedance of CONTROL THERMISTOR:															
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td colspan="3">-----</td></tr><tr><td>PREHEAT/P3 - SOCKETS</td><td></td><td>10 K ohms warm,</td></tr><tr><td>PLATEN</td><td>7 and 8</td><td>6.2 K ohms cold</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	-----			PREHEAT/P3 - SOCKETS		10 K ohms warm,	PLATEN	7 and 8	6.2 K ohms cold
MULTIMETER TL-3424																
Location	Connection	Impedance														

PREHEAT/P3 - SOCKETS		10 K ohms warm,														
PLATEN	7 and 8	6.2 K ohms cold														
<ul style="list-style-type: none">- Drive signal to HEATER not correct.	<ul style="list-style-type: none">- Check the drive signal:															
	<table><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td colspan="3">-----</td></tr><tr><td>TL-3577</td><td>PIN 12</td><td>Pulse</td></tr></table>	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	-----			TL-3577	PIN 12	Pulse			
TL-3577, TL-3624, TL-3008																
Location	Connection	Signal														

TL-3577	PIN 12	Pulse														

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H17 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																
- The power supply to the HEATER or THERMISTOR has a malfunction.	- See the Checkout Procedure for Temperature Too High and check the +14 V power supply: <table><tr><th colspan="4">TL-3577, TL-3624, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>TL-3577</td><td>PIN 7</td><td>PIN 5</td><td>+14 V dc</td></tr><tr><td></td><td>or 8</td><td>or 6</td><td></td></tr></table>	TL-3577, TL-3624, TL-3424				Location	+	Ground	Voltage	TL-3577	PIN 7	PIN 5	+14 V dc		or 8	or 6	
TL-3577, TL-3624, TL-3424																	
Location	+	Ground	Voltage														
TL-3577	PIN 7	PIN 5	+14 V dc														
	or 8	or 6															

H17 - "DTSC PREHEAT BOTTOM" "TOO HIGH"

Description

The software continually monitors the temperature of the CONTROL THERMISTORS that operate the 4 HEATERS:

- "PREHEAT CAP" is the HEATER in the PREHEAT ARM
- "PREHEAT BOTTOM" is the HEATER in the PLATEN below the PREHEAT ARM
- "READ CAP" is the HEATER in the READ ARM
- "READ BOTTOM" is the HEATER in the PLATEN below the READ ARM.

If the readings indicate that the temperature in the PREHEAT PLATEN is above 37.2° C (99.0° F) error code H17 occurs with the message "TOO HIGH".

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H17 does not occur again, the checkout and repair are completed.

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts

PREHEAT PLATEN ASSEMBLY 351566
FAN ASSEMBLY 351491
FUSE 337488
ANALOG BOARD 351461
CONTROLLER BOARD 351460

Possible Causes	Recommended Actions									
- Temperature/humidity at the site is not within site specifications.	- Check Site Specifications.									
- The FAN does not operate correctly.	- Do Checkout Procedure for Temperature Too High. To check the operation of the FAN:									
- The FUSES F3 and F4 for the FAN need replacement.	- Replace FUSES F3 and F4 on the CONTROLLER BOARD if necessary.									
	- Seat CONNECTOR P6 on CONTROLLER BOARD.									
	- Check voltage:									
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>BOARD</th><th>Connection</th><th>Voltage</th></tr><tr><td>CONTROLLER</td><td>J6 - PINS 1 and 2</td><td>+12 V dc</td></tr></table>	MULTIMETER TL-3424			BOARD	Connection	Voltage	CONTROLLER	J6 - PINS 1 and 2	+12 V dc
MULTIMETER TL-3424										
BOARD	Connection	Voltage								
CONTROLLER	J6 - PINS 1 and 2	+12 V dc								
- CONNECTOR P3 is loose or has damage.	- Seat CONNECTOR P3.									
	- Check impedance of CONNECTOR P3:									
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>PREHEAT</td><td>P3 - PINS 9 and 11</td><td>less than 100 ohms</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	PREHEAT	P3 - PINS 9 and 11	less than 100 ohms
MULTIMETER TL-3424										
Location	Connection	Impedance								
PREHEAT	P3 - PINS 9 and 11	less than 100 ohms								
- CONTROL THERMISTOR has a malfunction.	- Check impedance of CONTROL THERMISTOR:									
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>PREHEAT</td><td>P3 - SOCKETS 7 and 8</td><td>10 K ohms warm, 16.2 K ohms cold</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	PREHEAT	P3 - SOCKETS 7 and 8	10 K ohms warm, 16.2 K ohms cold
MULTIMETER TL-3424										
Location	Connection	Impedance								
PREHEAT	P3 - SOCKETS 7 and 8	10 K ohms warm, 16.2 K ohms cold								

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the OTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H17 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions												
- The drive signal to the HEATER does not deenergize when it should.	<table><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td colspan="3">-----</td></tr><tr><td>TL-3577</td><td>PIN 12</td><td>See note</td></tr></table> <p>NOTE</p> <p>If the signal does not pulse but is energized continually, install a new CONTROLLER BOARD.</p> <p>If the signal flickers, install a new ANALOG BOARD.</p>	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	-----			TL-3577	PIN 12	See note
TL-3577, TL-3624, TL-3008													
Location	Connection	Signal											

TL-3577	PIN 12	See note											

H18 - "DTSC READ CAP" "TOO LOW"

Description

The software continually monitors the temperature of the CONTROL THERMISTORS that operate the 4 HEATERS:

- "PREHEAT CAP" is the HEATER in the PREHEAT ARM.
- "PREHEAT BOTTOM" is the HEATER in the PLATEN below the PREHEAT ARM.
- "READ CAP" is the HEATER in the READ ARM.
- "READ BOTTOM" is the HEATER in the PLATEN below the READ ARM.

If the readings indicate that the temperature in the READ ARM is below 36.8° C (98.2° F) error code H18 occurs with the message "TOO LOW".

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts

READ ARM AND HEATER ASSEMBLY 351576
FUSE 337490
ANALOG BOARD 351461
CONTROLLER BOARD 351460

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H18 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions												
- Temperature/humidity at the site is not within site specifications.	- Check Site Specifications.												
- CONNECTOR P2 is loose or has damage.	- Do the Checkout Procedure for Temperature Too Low:												
- HEATER has damage.	- Seat CONNECTOR P2 on ANALOG BOARD.												
	- Check impedance of HEATER at CONNECTOR P2:												
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>READ</td><td>P2 - SOCKETS</td><td>less than</td></tr><tr><td>ARM</td><td>1 and 2</td><td>100 ohms</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	READ	P2 - SOCKETS	less than	ARM	1 and 2	100 ohms
MULTIMETER TL-3424													
Location	Connection	Impedance											
READ	P2 - SOCKETS	less than											
ARM	1 and 2	100 ohms											
- FUSES have damage.	- Check FUSES F2 and F5 on CONTROLLER BOARD.												
- CONTROL THERMISTOR has a malfunction.	- Check impedance of CONTROL THERMISTOR:												
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>READ</td><td>P2 - SOCKETS</td><td>10 K ohms warm,</td></tr><tr><td>ARM</td><td>4 and 5</td><td>16.2 K ohms cold</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	READ	P2 - SOCKETS	10 K ohms warm,	ARM	4 and 5	16.2 K ohms cold
MULTIMETER TL-3424													
Location	Connection	Impedance											
READ	P2 - SOCKETS	10 K ohms warm,											
ARM	4 and 5	16.2 K ohms cold											
- Drive signal to HEATER not correct.	- Check the drive signal:												
	<table><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td>TL-3577</td><td>PIN 11</td><td>Pulse</td></tr></table>	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PIN 11	Pulse			
TL-3577, TL-3624, TL-3008													
Location	Connection	Signal											
TL-3577	PIN 11	Pulse											

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H18 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																
<p>- The power supply to the HEATER or THERMISTOR has a malfunction.</p>	<p>- See the Checkout Procedure for Temperature Too High and check the +14 V power supply:</p> <table><tr><th colspan="4">TL-3577, TL-3624, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>TL-3577</td><td>PIN 7</td><td>PIN 5</td><td>+14 V dc</td></tr><tr><td></td><td>or 8</td><td>or 6</td><td></td></tr></table>	TL-3577, TL-3624, TL-3424				Location	+	Ground	Voltage	TL-3577	PIN 7	PIN 5	+14 V dc		or 8	or 6	
TL-3577, TL-3624, TL-3424																	
Location	+	Ground	Voltage														
TL-3577	PIN 7	PIN 5	+14 V dc														
	or 8	or 6															

H18 - "DTSC READ CAP" "TOO HIGH"

Description

The software continually monitors the temperature of the CONTROL THERMISTORS that operate the 4 HEATERS:

- "PREHEAT CAP" is the HEATER in the PREHEAT ARM
- "PREHEAT BOTTOM" is the HEATER in the PLATEN below the PREHEAT ARM
- "READ CAP" is the HEATER in the READ ARM
- "READ BOTTOM" is the HEATER in the PLATEN below the READ ARM.

If the readings indicate that the temperature in the PREHEAT ARM is above 37.2° C (98.9° F) error code H18 occurs with the message "TOO HIGH".

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts

READ ARM AND HEATER ASSEMBLY 351576
FAN ASSEMBLY 351491
FUSE 357488
ANALOG BOARD 351461
CONTROLLER BOARD 351460

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H18 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions									
<ul style="list-style-type: none">- Temperature/humidity at the site is not within site specifications.	<ul style="list-style-type: none">- Check Site Specifications.									
<ul style="list-style-type: none">- The FAN does not operate correctly.- The FUSES F3 and F4 for the FAN need replacement.	<ul style="list-style-type: none">- Do Checkout Procedure for Temperature Too High. To check the operation of the FAN:<ul style="list-style-type: none">- Replace FUSES F3 and F4 on the CONTROLLER BOARD if necessary.- Seat CONNECTOR P6 on CONTROLLER BOARD.- Check voltage: <table border="1"><thead><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>BOARD</th><th>Connection</th><th>Voltage</th></tr></thead><tbody><tr><td>CONTROLLER</td><td>J6 - PINS 1 and 2</td><td>+12 V dc</td></tr></tbody></table>	MULTIMETER TL-3424			BOARD	Connection	Voltage	CONTROLLER	J6 - PINS 1 and 2	+12 V dc
MULTIMETER TL-3424										
BOARD	Connection	Voltage								
CONTROLLER	J6 - PINS 1 and 2	+12 V dc								
<ul style="list-style-type: none">- CONNECTOR P2 is loose or has damage.	<ul style="list-style-type: none">- Seat CONNECTOR P2- Check impedance of CONNECTOR P2: <table border="1"><thead><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr></thead><tbody><tr><td>READ ARM</td><td>P2 - PINS 1 and 2</td><td>less than 100 ohms</td></tr></tbody></table>	MULTIMETER TL-3424			Location	Connection	Impedance	READ ARM	P2 - PINS 1 and 2	less than 100 ohms
MULTIMETER TL-3424										
Location	Connection	Impedance								
READ ARM	P2 - PINS 1 and 2	less than 100 ohms								
<ul style="list-style-type: none">- CONTROL THERMISTOR has a malfunction.	<ul style="list-style-type: none">- Check impedance of CONTROL THERMISTOR: <table border="1"><thead><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr></thead><tbody><tr><td>READ ARM</td><td>P2 - SOCKETS 4 and 5</td><td>10 K ohms warm, 16.2 K ohms cold</td></tr></tbody></table>	MULTIMETER TL-3424			Location	Connection	Impedance	READ ARM	P2 - SOCKETS 4 and 5	10 K ohms warm, 16.2 K ohms cold
MULTIMETER TL-3424										
Location	Connection	Impedance								
READ ARM	P2 - SOCKETS 4 and 5	10 K ohms warm, 16.2 K ohms cold								

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H18 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions									
<p>- The drive signal to the HEATER does not deenergize when it should.</p>	<table><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td>TL-3577</td><td>PIN 11</td><td>See note</td></tr></table> <p>NOTE</p> <p>If the signal does not pulse but is energized continually, install a new CONTROLLER BOARD.</p> <p>If the signal flickers, install a new ANALOG BOARD.</p>	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PIN 11	See note
TL-3577, TL-3624, TL-3008										
Location	Connection	Signal								
TL-3577	PIN 11	See note								

H19 - "DTSC READ BOTTOM" "TOO LOW"

Description

The software continually monitors the temperature of the CONTROL THERMISTORS that operate the 4 HEATERS:

- "PREHEAT CAP" is the HEATER in the PREHEAT ARM
- "PREHEAT BOTTOM" is the HEATER in the PLATEN below the PREHEAT ARM
- "READ CAP" is the HEATER in the READ ARM
- "READ BOTTOM" is the HEATER in the PLATEN below the READ ARM.

If the readings indicate that the temperature in the READ PLATEN is below 36.8° C (98.2° F) error code H19 occurs with the message "TOO LOW".

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts

PREHEAT PLATEN ASSEMBLY 351566
FAN ASSEMBLY 351491
FUSE 337490
ANALOG BOARD 351461
CONTROLLER BOARD 351460

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H19 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions												
<ul style="list-style-type: none">- Temperature/humidity at the site is not within site specifications.	<ul style="list-style-type: none">- Check Site Specifications.												
<ul style="list-style-type: none">- CONNECTOR P3 is loose or has damage.- HEATER has damage.	<ul style="list-style-type: none">- Do the Checkout Procedure for Temperature Too Low:<ul style="list-style-type: none">- Seat CONNECTOR P3 on ANALOG BOARD.- Check impedance of HEATER at CONNECTOR P3: <table border="1"><thead><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr></thead><tbody><tr><td>READ</td><td>P3 - SOCKETS</td><td>less than</td></tr><tr><td>PLATEN</td><td>1 and 2</td><td>100 ohms</td></tr></tbody></table>	MULTIMETER TL-3424			Location	Connection	Impedance	READ	P3 - SOCKETS	less than	PLATEN	1 and 2	100 ohms
MULTIMETER TL-3424													
Location	Connection	Impedance											
READ	P3 - SOCKETS	less than											
PLATEN	1 and 2	100 ohms											
<ul style="list-style-type: none">- FUSES have damage.	<ul style="list-style-type: none">- Check FUSES F2 and F5 on CONTROLLER BOARD.												
<ul style="list-style-type: none">- CONTROL THERMISTOR has a malfunction.	<ul style="list-style-type: none">- Check impedance of CONTROL THERMISTOR: <table border="1"><thead><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr></thead><tbody><tr><td>READ</td><td>P3 - SOCKETS</td><td>10 K ohms warm,</td></tr><tr><td>PLATEN</td><td>4 and 3</td><td>6.2 K ohms cold</td></tr></tbody></table>	MULTIMETER TL-3424			Location	Connection	Impedance	READ	P3 - SOCKETS	10 K ohms warm,	PLATEN	4 and 3	6.2 K ohms cold
MULTIMETER TL-3424													
Location	Connection	Impedance											
READ	P3 - SOCKETS	10 K ohms warm,											
PLATEN	4 and 3	6.2 K ohms cold											
<ul style="list-style-type: none">- Drive signal to HEATER not correct.	<ul style="list-style-type: none">- Check the drive signal: <table border="1"><thead><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr></thead><tbody><tr><td>TL-3577</td><td>PIN 9</td><td>Pulse</td></tr></tbody></table>	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PIN 9	Pulse			
TL-3577, TL-3624, TL-3008													
Location	Connection	Signal											
TL-3577	PIN 9	Pulse											

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H19 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions												
- The power supply to the HEATER or THERMISTOR has a malfunction.	- See the Checkout Procedure for Temperature Too High and check the +14 V power supply: <table><tr><th colspan="4">TL-3577, TL-3624, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>TL-3577</td><td>PIN 7 or 8</td><td>PIN 5 or 6</td><td>+14 V dc</td></tr></table>	TL-3577, TL-3624, TL-3424				Location	+	Ground	Voltage	TL-3577	PIN 7 or 8	PIN 5 or 6	+14 V dc
TL-3577, TL-3624, TL-3424													
Location	+	Ground	Voltage										
TL-3577	PIN 7 or 8	PIN 5 or 6	+14 V dc										

H19 - "DTSC READ BOTTOM" "TOO HIGH"

Description

The software continually monitors the temperature of the CONTROL THERMISTORS that operate the 4 HEATERS:

- "PREHEAT CAP" is the HEATER in the PREHEAT ARM
- "PREHEAT BOTTOM" is the HEATER in the PLATEN below the PREHEAT ARM
- "READ CAP" is the HEATER in the READ ARM
- "READ BOTTOM" is the HEATER in the PLATEN below the READ ARM.

If the readings indicate that the temperature in the PREHEAT PLATEN is above 37.2° C (98.9° F) error code H19 occurs with the message "TOO HIGH".

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts

PREHEAT PLATEN ASSEMBLY 351566
FAN ASSEMBLY 351491
FUSE 337488
ANALOG BOARD 351461
CONTROLLER BOARD 351460

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H19 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions									
<ul style="list-style-type: none">- Temperature/humidity at the site is not within site specifications.	<ul style="list-style-type: none">- Check Site Specifications.									
<ul style="list-style-type: none">- The FAN does not operate correctly.- The FUSES F3 and F4 for the FAN need replacement.	<ul style="list-style-type: none">- Do Checkout Procedure for Temperature Too High. To check the operation of the FAN:<ul style="list-style-type: none">- Replace FUSES F3 and F4 on the CONTROLLER BOARD if necessary.- Seat CONNECTOR P6 on CONTROLLER BOARD.- Check voltage:									
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>BOARD</th><th>Connection</th><th>Voltage</th></tr><tr><td>CONTROLLER</td><td>J6 - PINS 1 and 2</td><td>+12 V dc</td></tr></table>	MULTIMETER TL-3424			BOARD	Connection	Voltage	CONTROLLER	J6 - PINS 1 and 2	+12 V dc
MULTIMETER TL-3424										
BOARD	Connection	Voltage								
CONTROLLER	J6 - PINS 1 and 2	+12 V dc								
<ul style="list-style-type: none">- CONNECTOR P3 is loose or has damage.	<ul style="list-style-type: none">- Seat CONNECTOR P3.- Check impedance of CONNECTOR P3:									
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>READ PLATEN</td><td>P3 - PINS 1 and 2</td><td>less than 100 ohms</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	READ PLATEN	P3 - PINS 1 and 2	less than 100 ohms
MULTIMETER TL-3424										
Location	Connection	Impedance								
READ PLATEN	P3 - PINS 1 and 2	less than 100 ohms								
<ul style="list-style-type: none">- CONTROL THERMISTOR has a malfunction.	<ul style="list-style-type: none">- Check impedance of CONTROL THERMISTOR:									
	<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>READ PLATEN</td><td>P3 - SOCKETS 3 and 4</td><td>10 K ohms warm, 6.2 K ohms cold</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	READ PLATEN	P3 - SOCKETS 3 and 4	10 K ohms warm, 6.2 K ohms cold
MULTIMETER TL-3424										
Location	Connection	Impedance								
READ PLATEN	P3 - SOCKETS 3 and 4	10 K ohms warm, 6.2 K ohms cold								

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the DTSC MODULE. Allow the HEATER 5 minutes to become warm. If error code H19 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions									
- The drive signal to the HEATER does not deenergize when it should.	<table><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td>TL-3577</td><td>PIN 9</td><td>See note</td></tr></table> <p>NOTE</p> <p>If the signal does not pulse but is energized continually, install a new CONTROLLER BOARD.</p> <p>If the signal flickers, install a new ANALOG BOARD.</p>	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PIN 9	See note
TL-3577, TL-3624, TL-3008										
Location	Connection	Signal								
TL-3577	PIN 9	See note								

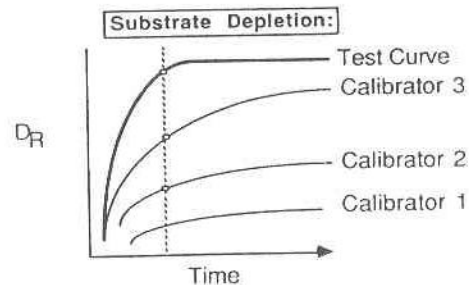
L11 - "RESULTS INVALID"

Description

In normal operation, the rate chemistry for a given test occurs within the limits that are calculated for each chemistry during calibration. If the level of activity is beyond these limits, error code L11 occurs.

Error code L11 indicates that a "Substrate Depletion" condition is detected. Substrate Depletion errors indicate that the change in the rate chemistry for the test occurred too fast. The readings from the slide indicate that the density of the slide was at the maximum value when the first readings were made. This condition could be caused because the sample on the slide had a large concentration of analyte.

The following figure gives an example of Substrate Depletion. The first reading of the Test Curve has a value higher than the corresponding value of the Calibrator 3 curve. The rate of change is less than the rate for the Calibrator 2 curve. When this type of test result occurs, error code L11 and the message "RESULTS INVALID" are displayed, and no test results are given.



Possible Replacement Parts

PIPETTE

Additional Information

Reference Guide
Operator's Manual

To Check for Correct Operation:

To check that the problem is repaired, operate the DTSC MODULE with any slide. If error code L11 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
- The concentration of the analyte in the sample fluid is too high.	- The operator should add a diluent to the sample fluid and process the test again. See the Operator's Manual.
- The drop volume is too large.	- Check that the PIPETTE operates correctly. - Check that the correct type of TIP is used. - If necessary, order a new PIPETTE.
- The slide is not made correctly.	- Use a slide with a new lot number and process the test again.

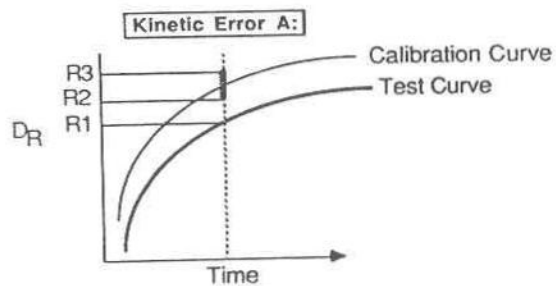
L12 – "RESULTS INVALID"

Description

In normal operation, a program compares the rate of change for a test with the value of the first reading. The first reading must occur within limits that are defined for a given rate of change of a density that is calculated during calibration. If the first reading is beyond the limit, an error condition defined as "Kinetic Error A" is detected. Error code L12 and the message "RESULTS INVALID" are displayed, and no test results are given.

Kinetic Error A could occur because the sample fluid is contaminated with materials that cause the density of the slide to be increases or decreased.

The following figure gives an example of Kinetic Error A. The test curve has the same slope as the calibration curve. The program requirement is that the first reading for any test curve with this slope should be within the limits R2 and R3. But the first reading of the test curve occurs at R1. Kinetic Error A has occurred, and error code L12 is displayed.



To Check for Correct Operation:

To check that the problem is repaired, operate the DTSC MODULE with any slide. If error code L12 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
- The sample fluid is contaminated.	- Process the test with control fluid. Check for error code L12.
- The operator did not handle the sample correctly.	- Observe the operator handling the sample, and instruct the operator about the correct procedures.
- The slide is not made correctly.	- Use a slide with a new lot number and process the test again.

Possible Replacement Parts

None

Additional Information

Reference Guide
Operator's Manual

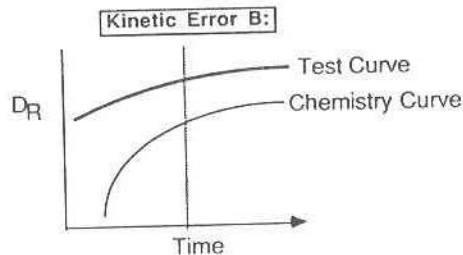
L13 – "RESULTS INVALID"

Description

In normal operation, the rate of change for a test should be stable when the slide is read. To check the rate of change, a program calculates 2 separate slopes for each half of the test time. The program then compares the slope of the first half with the slope of the other half, and calculates a ratio. The ratio should be similar to the slope ratio for that chemistry that was calculated for the Supplementary Assigned Values, or SAVs, stored in the CDM. If the test curve does not fulfill this requirement, error code L13 and the message "RESULTS INVALID" are displayed, and no test results are given.

This error condition is defined as "Kinetic Error B". Kinetic Error B could occur because the concentration of analyte is too high. Kinetic Error B could also occur because the sample fluid is contaminated, or if the patient has multiple myeloma, a pathology.

The following figure gives an example of Kinetic Error B. The last part of test curve has a slope that corresponds to the chemistry curve. The first part of the test curve has a slope that does not correspond to the chemistry curve.



Possible Replacement Parts

PIPETTE

Additional Information

Reference Guide
Operator's Manual

To Check for Correct Operation:

To check that the problem is repaired, operate the DTSC MODULE with any slide. If error code L13 does not occur again, the checkout and repair are completed.

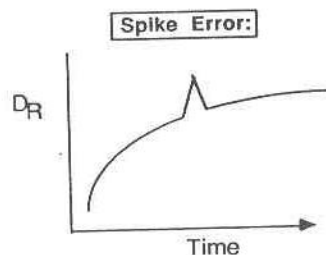
Possible Causes	Recommended Actions
- The concentration of the analyte in the sample fluid is too high.	- The operator should add a diluent to the sample fluid and process the test again. See section in The Operator's Manual.
- The drop volume is too large or too small.	- Check that the PIPETTE operates correctly. - Check that the correct type of TIP is used. - If necessary, order a new PIPETTE.
- The sample fluid is contaminated.	- Process the test with control fluid. Check for error code L12.
- The operator did not handle the sample correctly.	- Observe the operator handling the sample, and instruct the operator about the correct procedures.
- The slide is not made correctly.	- Use a slide with a new lot number and process the test again. If necessary, obtain more information from the CPD Hotline.

L14 – "RESULTS INVALID"

Description

The program that calculates test results has a complex checking system that monitors the value for each reading. The readings should generally move in a uniform direction, but some variation is normal and does not indicate a malfunction. When a reading exceeds the allowed limits, error code L14 and the message "RESULTS INVALID" are displayed. No test results are given.

This type of error is defined as a "Spike Error". The following figure gives an example of a Spike Error.



A Spike Error could be caused by large variations in the main power circuit, or malfunctions of the flash system.

Possible Replacement Parts

FLASH LAMP 337379
FLASH ASSEMBLY 351571
FUSE 337355
FLASH ASSEMBLY 351571

Additional Information

Reference Guide
Adjustment for the FLASH LAMP – Illumination
Site Specifications

To Check for Correct Operation:

To check that the problem is repaired, operate the DTSC MODULE with any slide. If error code L14 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
- The Flash System has intermittent malfunctions.	- Do the Checkout Procedure for the Flash System.
- Interference in the main power source.	- Instruct the customer to check the main power source. See the Site Specifications.

L15 - "GAIN OUT OF LIMITS"

Description

Error code L15 occurs only when the DTSC MODULE initializes.

Gain factors increase the voltage of the output signals of the A/D CONVERTER on the ANALOG BOARD. Gains are calculated for each filter position, and for both the SAMPLE and REFERENCE CHANNELS when the DTSC MODULE is energized. If the gains are too large, excessive voltage could cause damage to the components of the ANALOG BOARD. To prevent excessive voltage, the software sets a limit on the gain. If any gain is beyond the limit when the gains are calculated, error code L15 occurs. The filter and CHANNEL that are beyond the limit are indicated on the printout. The LC DISPLAY on the DT60 ANALYZER indicates that the DTSC MODULE is not ready.

Special Tools

MULTIMETER TL-3424
TEST POINT BOARD TL-3577
LOGIC PROBE TL-3008
RIBBON CABLE TL-3624

Possible Replacement Parts

FLASH LAMP 337379
FUSE 337355
FLASH ASSEMBLY 351571
CONTROLLER BOARD 351460
READ ARM AND HEATER ASSEMBLY 351678
REFLECTOMETER ASSEMBLY 351670
ANALOG BOARD 351461
In DT60 ANALYZER: CPU BOARD

To Check for Correct Operation:

To check that the problem is repaired, move the MAIN POWER SWITCH down and then up to calculate new gains. If error code L15 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																				
<ul style="list-style-type: none">- Intermittent software malfunction.	<ul style="list-style-type: none">- Move the MAIN POWER SWITCH down. Wait 3 seconds. Move the MAIN POWER SWITCH up.																				
<ul style="list-style-type: none">- The illumination from the FLASH LAMP is too low.- The FLASH POWER SUPPLY has a malfunction.- CONTROLLER BOARD: CONNECTOR P4 is loose or has damage.	<ul style="list-style-type: none">- Do the Checkout Procedure for the Flash System.<ul style="list-style-type: none">- Seat CONNECTOR P4.- Check that CONNECTOR P4 has correct voltage <table><tr><th colspan="4">TL-3577, TL-3578, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>CONTROLLER BOARD - J4</td><td>PIN 1</td><td>E3 or TP4</td><td>+5 V dc</td></tr><tr><td>CONTROLLER BOARD - J4</td><td>PIN 2</td><td>E3 or TP4</td><td>+12 V ac</td></tr><tr><td>CONTROLLER BOARD - J4</td><td>PIN 3</td><td>E3 or TP4</td><td>+12 V ac</td></tr></table>	TL-3577, TL-3578, TL-3424				Location	+	Ground	Voltage	CONTROLLER BOARD - J4	PIN 1	E3 or TP4	+5 V dc	CONTROLLER BOARD - J4	PIN 2	E3 or TP4	+12 V ac	CONTROLLER BOARD - J4	PIN 3	E3 or TP4	+12 V ac
TL-3577, TL-3578, TL-3424																					
Location	+	Ground	Voltage																		
CONTROLLER BOARD - J4	PIN 1	E3 or TP4	+5 V dc																		
CONTROLLER BOARD - J4	PIN 2	E3 or TP4	+12 V ac																		
CONTROLLER BOARD - J4	PIN 3	E3 or TP4	+12 V ac																		
<ul style="list-style-type: none">- The optics are broken or dirty.	<ul style="list-style-type: none">- Do the Checkout Procedure for REFLECTOMETER ASSEMBLY and Optics System. Check WHITE REFERENCE, SAPPHIRE WINDOW.																				
<ul style="list-style-type: none">- The SLIDER CAM does not move the WHITE REFERENCE to the correct position at the correct time.	<ul style="list-style-type: none">- Do the Checkout Procedure for the Slide Transport System.- Do the Checkout Procedure for the STEPPER MOTORS. Execute option 111 and check the drive signals for the CAM DRIVE MOTOR: <table><tr><th colspan="3">TL-3577, TL-3578, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td>TL-3577</td><td>PINS 35 to 38</td><td>All pulse</td></tr></table>	TL-3577, TL-3578, TL-3008			Location	Connection	Signal	TL-3577	PINS 35 to 38	All pulse											
TL-3577, TL-3578, TL-3008																					
Location	Connection	Signal																			
TL-3577	PINS 35 to 38	All pulse																			

To Check for Correct Operation:

To check that the problem is repaired, move the MAIN POWER SWITCH down and then up to calculate new gains. If error code L15 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
- The ANALOG or CONTROLLER BOARDS have malfunctions.	- Seat CONNECTORS. If necessary, install new ANALOG or CONTROLLER BOARDS.
- The CPU BOARD in the DT60 ANALYZER has a malfunction.	- Do the Checkout Procedure for I/O and CPU BOARDS. Install a new CPU BOARD if necessary.

L16 - "MATH ERROR IN GAIN CALCULATION"

Description

Error code L16 only occurs when the DTSC MODULE initializes.

In normal operation, readings for calculating gains are taken when the DTSC MODULE initializes. The analog readings are changed to a digital signal by the A/D CONVERTER on the ANALOG BOARD. This data is transferred to the CPU BOARD in the DT60 ANALYZER. The CPU BOARD calculates gains for rate chemistries, then transfers the gains to the NONVOLATILE RAM in the DTSC MODULE.

Error code L16 occurs when the CPU BOARD cannot calculate the gains. The software for the calculation could have a malfunction, or the data sent from the ANALOG BOARD might have values that the CPU BOARD cannot use for the calculation.

Possible Replacement Parts

CPU BOARD in the DT60 ANALYZER
ANALOG BOARD 351461

To Check for Correct Operation:

To check that the problem is repaired, move the MAIN POWER SWITCH down and then up to calculate new gains. If error code L16 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
- Intermittent software malfunction.	- Move the MAIN POWER SWITCH down. Wait 3 seconds. Move the MAIN POWER SWITCH up.
- The software in the CPU BOARD has a malfunction.	- Do the Checkout Procedure for I/O and CPU BOARDS. Install a new CPU BOARD if necessary.
- The A/D CONVERTER in the ANALOG BOARD has a malfunction.	- Install a new ANALOG BOARD.

L17 - "GAIN READING OSCILLATING"

Description

Error code L17 only occurs when the DTSC MODULE initializes.

In normal operation, the CPU BOARD in the DT60 ANALYZER calculates gains for rate chemistries. The new gains are transferred to the DTSC MODULE. The DTSC MODULE processes a reading using the new gains. The result must be within the following limits:

$$- \text{(Gain of REFERENCE CHANNEL)} \times \text{(Reading in REFERENCE CHANNEL)} = 90\% \text{ to } 94\% \text{ of the maximum reading using } 10 \text{ V dc}$$

$$- \frac{\text{(Gain of SAMPLE CHANNEL)} \times \text{(Sample reading)}}{\text{(Gain of REFERENCE CHANNEL)} \times \text{(Reference reading)}} = 87.5\% \text{ to } 92.5\%$$

If the result is within within the limits, another gain is used. The result is must also be within the limit.

Error code L19 occurs when 8 gains are calculated and used, and none of the results are within the limits.

Special Tools

MULTIMETER TL-3424
TEST POINT BOARD TL-3577
LOGIC PROBE TL-3008
RIBBON CABLE TL-3624

Possible Replacement Parts

ANALOG BOARD 351461
FLASH LAMP 337379

To Check for Correct Operation:

To check that the problem is repaired, move the MAIN POWER SWITCH down and then up to calculate new gains. If error code L17 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																																
- Intermittent software malfunction.	- Move the MAIN POWER SWITCH down. Wait 3 seconds. Move the MAIN POWER SWITCH up.																																
- The REFLECTOMETER or optics do not transmit enough light.	- Do the Checkout Procedure for REFLECTOMETER ASSEMBLY and Optics System.																																
- The illumination from the FLASH LAMP is too low.	- Do the Checkout Procedure for the Flash System.																																
- The FLASH POWER SUPPLY has a malfunction.																																	
- CONTROLLER BOARD: CONNECTOR P4 is loose or has damage.	Check that CONNECTOR J4 operates correctly: <table><tr><th colspan="4">TL-3577, TL-3578, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>CONTROLLER/PIN 1</td><td>E3 or</td><td>TP4</td><td>+5 V dc</td></tr><tr><td>BOARD - J4</td><td></td><td></td><td></td></tr><tr><td>CONTROLLER/PIN 2</td><td>E3 or</td><td>TP4</td><td>+12 V ac</td></tr><tr><td>BOARD - J4</td><td></td><td></td><td></td></tr><tr><td>CONTROLLER/PIN 3</td><td>E3 or</td><td>TP4</td><td>+12 V ac</td></tr><tr><td>BOARD - J4</td><td></td><td></td><td></td></tr></table>	TL-3577, TL-3578, TL-3424				Location	+	Ground	Voltage	CONTROLLER/PIN 1	E3 or	TP4	+5 V dc	BOARD - J4				CONTROLLER/PIN 2	E3 or	TP4	+12 V ac	BOARD - J4				CONTROLLER/PIN 3	E3 or	TP4	+12 V ac	BOARD - J4			
TL-3577, TL-3578, TL-3424																																	
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BOARD - J4																																	
CONTROLLER/PIN 3	E3 or	TP4	+12 V ac																														
BOARD - J4																																	

To Check for Correct Operation:

To check that the problem is repaired, move the MAIN POWER SWITCH down and then up to calculate new gains. If error code L17 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions												
<ul style="list-style-type: none">- The SLIDER CAM does not move the WHITE REFERENCE to the correct position at the correct time.	<ul style="list-style-type: none">- Do the Checkout Procedure for the Slide Transport System.- Do the Checkout Procedure for the STEPPER MOTORS. Execute option 111 and check the drive signals for the CAM DRIVE MOTOR:<table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td>CAM DRIVE MOTOR</td><td>P12 - PINS 5 and 6</td><td>150 ohms</td></tr><tr><td>CAM DRIVE MOTOR</td><td>P12 - PINS 2 and 3</td><td>150 ohms</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Signal	CAM DRIVE MOTOR	P12 - PINS 5 and 6	150 ohms	CAM DRIVE MOTOR	P12 - PINS 2 and 3	150 ohms
MULTIMETER TL-3424													
Location	Connection	Signal											
CAM DRIVE MOTOR	P12 - PINS 5 and 6	150 ohms											
CAM DRIVE MOTOR	P12 - PINS 2 and 3	150 ohms											
<ul style="list-style-type: none">- The software in the CPU BOARD has a malfunction.	<ul style="list-style-type: none">- Do the Checkout Procedure for I/O and CPU BOARDS. Install a new CPU BOARD if necessary.												
<ul style="list-style-type: none">- The A/D CONVERTER in the ANALOG BOARD has a malfunction.	<ul style="list-style-type: none">- Seat CONNECTOR P9. Install a new ANALOG BOARD if necessary.												
<ul style="list-style-type: none">- The filters are dirty.	<ul style="list-style-type: none">- Clean the filters.												

L18 - "INVALID DTSC SPOT"

Description

In normal operation, after a slide enters the Spotting Station, a 3 second delay occurs to allow the SPOT DETECTOR SENSOR to become stable. After the 3 second delay, the SPOT DETECTOR SENSOR is able to detect the reduction in reflectance that occurs when a drop of fluid is dispensed on the slide.

LED DS5 of the ANALOG BOARD is energized when there is no reflectance to the SPOT DETECTOR SENSOR. The normal sequence for LED DS5 is:

Condition	LED DS5
No slide in Spot Station.	Off. Detects light from TRACK.
Slide enters Spot Station.	Flickers. Detects black and white lines in bar code as slide moves under SPOT DETECTOR SENSOR.
3 second delay.	Off. Detects reflection from white center of slide.
Slide spot.	On. Reduced reflectance from slide.
Slide absorbs drop.	Off.

Error code L18 occurs when the SPOT DETECTOR SENSOR detects a reduction in reflectance during the 3 second delay. This normally indicates that the operator dispensed fluid on the slide before the "SPOT SLIDE WITH FLUID" message was displayed. But there are equipment malfunctions that could cause this error code to occur when the operator procedure is correct.

Special Tools

NH₃ slide

Possible Replacement Parts

SPOT DETECTOR ASSEMBLY 351492
ANALOG BOARD 351461

Additional Information

Adjustment procedure for SPOT DETECTOR SENSOR - Voltage

To Check for Correct Operation:

To check that the problem is repaired, use option 108 with a slide and check that LED DS5 operates correctly. Then operate with slides in run mode and see if error code L19 occurs.

Possible Causes	Recommended Actions
<ul style="list-style-type: none"> - Operator dispensed fluid before the correct time. - Excessive pressure on the PIPETTE could cause a spot signal. 	<ul style="list-style-type: none"> - Instruct operator in correct procedure.
<ul style="list-style-type: none"> - SPOT DETECTOR SENSOR is loose. - CONNECTOR J6 is loose. - Adjustment for SPOT DETECTOR SENSOR - Voltage is wrong. - Adjustment for TIP - Height is wrong. - Intermittent voltage to SPOT DETECTOR SENSOR, CONNECTOR J9. - Spotting signal is not stable. 	<ul style="list-style-type: none"> - See the Checkout Procedure for Metering System and Spotting Station.

L19 - "INVALID DTSC BARCODE"

Description

In normal operation, the BAR CODE READER BOARD holds the bar code for an inserted slide. The bar code data are transferred to the ANALOG BOARD, and then to the CONTROLLER BOARD. The DT60 ANALYZER sends a message to the DTSC MODULE to indicate that it is read to receive the bar code data. Then the CONTROLLER BOARD sends the data to the DT60 ANALYZER.

Error code L19 occurs when DTSC MODULE does not transfer bar code data in response to the message from the DT60 ANALYZER.

Error code L19 also occurs when the operator presses the "enter" key after the DT60 ANALYZER displays a message instructing the operator to manually enter the slide identification.

After the error code is displayed, the Slide Transport System in the DTSC MODULE returns the slide to the Pickup Station.

Possible Replacement Parts

BAR CODE READER 351463
SLIDE TRANSPORT MOTOR ASSEMBLY 351588
CONTROLLER BOARD 351460
ANALOG BOARD 351461

Additional Information

Adjustment Procedure for BAR CODE READER - Voltage

To Check for Correct Operation:

To check that the problem is repaired, operate with slides in run mode and see if error code L19 occurs.

Possible Causes	Recommended Actions
- Slide was inserted in the wrong position.	- Instruct operator in the correct procedure.
- The bar code on the slide is not in the correct format.	- Speak to the CPD Hotline.
- BAR CODE READER is not adjusted correctly.	- Adjust the BAR CODE READER - Voltage.
- CONNECTOR P7 for the BAR CODE READER is loose.	- Seat CONNECTOR P7 on the ANALOG BOARD.
- The motion of the slide is erratic.	- Do the Checkout Procedure for Slide Transport System. - Do the Checkout Procedure for STEPPER MOTORS and check the SLIDE TRANSPORT MOTOR.
- The BAR CODE READER has a malfunction.	- Do the Checkout Procedure for BAR CODE READER. Check that LED DS5 on the ANALOG energizes and deenergizes correctly.

L20 - "RATIO WHITE OUT OF RANGE"

In normal operation, a ratiometric reading is made on the WHITE REFERENCE in the READ ARM before the slide enters the Read Station. This white reference reading must have a value of 26140 to 32676 A/D units. If the reading is not within the limits, error code L20 occurs. No test results are given.

Special Tools

MULTIMETER TL-3424
TEST POINT BOARD TL-3577
LOGIC PROBE TL-3008
RIBBON CABLE TL-3624

Possible Replacement Parts

FLASH LAMP 337379
FUSE 337355
FLASH ASSEMBLY 351571
CONTROLLER BOARD 351460
READ ARM AND HEATER ASSEMBLY 351678
REFLECTOMETER ASSEMBLY 351670
ANALOG BOARD 351461
In DT60 ANALYZER: CPU BOARD

To Check for Correct Operation:

To check that the problem is repaired, execute the test again. If error code L20 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																				
<ul style="list-style-type: none">- Intermittent software malfunction.	<ul style="list-style-type: none">- Move the MAIN POWER SWITCH down. Wait 3 seconds. Move the MAIN POWER SWITCH up.																				
<ul style="list-style-type: none">- The illumination from the FLASH LAMP is too low.- The FLASH POWER SUPPLY has a malfunction.	<ul style="list-style-type: none">- Do the Checkout Procedure for the Flash System. <p>Check that CONNECTOR J4 operates correctly:</p> <table><tr><th colspan="4">TL-3577, TL-3578, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>CONTROLLER BOARD - J4</td><td>PIN 1</td><td>E3 or TP4</td><td>+5 V dc</td></tr><tr><td>CONTROLLER BOARD - J4</td><td>PIN 2</td><td>E3 or TP4</td><td>+12 V ac</td></tr><tr><td>CONTROLLER BOARD - J4</td><td>PIN 3</td><td>E3 or TP4</td><td>+12 V ac</td></tr></table>	TL-3577, TL-3578, TL-3424				Location	+	Ground	Voltage	CONTROLLER BOARD - J4	PIN 1	E3 or TP4	+5 V dc	CONTROLLER BOARD - J4	PIN 2	E3 or TP4	+12 V ac	CONTROLLER BOARD - J4	PIN 3	E3 or TP4	+12 V ac
TL-3577, TL-3578, TL-3424																					
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CONTROLLER BOARD - J4	PIN 2	E3 or TP4	+12 V ac																		
CONTROLLER BOARD - J4	PIN 3	E3 or TP4	+12 V ac																		
<ul style="list-style-type: none">- CONTROLLER BOARD: CONNECTOR P4 is loose or has damage.																					
<ul style="list-style-type: none">- The optics are broken or dirty.	<ul style="list-style-type: none">- Do the Checkout Procedure for REFLECTOMETER ASSEMBLY and Optics System.																				
<ul style="list-style-type: none">- The SLIDER CAM does not move the WHITE REFERENCE to the correct position at the correct time.	<ul style="list-style-type: none">- Do the Checkout Procedure for the Slide Transport System.- Do the Checkout Procedure for the STEPPER MOTORS. Execute option 111 and check the drive signals for the CAM DRIVE MOTOR: <table><tr><th colspan="3">TL-3577, TL-3578, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td>TL-3577</td><td>PINS 35 to 38</td><td>All pulse</td></tr></table>	TL-3577, TL-3578, TL-3008			Location	Connection	Signal	TL-3577	PINS 35 to 38	All pulse											
TL-3577, TL-3578, TL-3008																					
Location	Connection	Signal																			
TL-3577	PINS 35 to 38	All pulse																			

More information on the next page.

To Check for Correct Operation:

To check that the problem is repaired, execute the test again. If error code L20 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
- The software in the CPU BOARD has a malfunction.	- Install a new CPU BOARD.
- The A/D CONVERTER in the ANALOG BOARD has a malfunction.	- Install a new ANALOG BOARD.
- The CONTROLLER BOARD has a malfunction.	- Install a new CONTROLLER BOARD.

L21 - "RATIO BLACK OUT OF RANGE"

Description

In normal operation, a ratiometric black reference reading is made for each test before the slide enters the Read Station. This reading is made when the READ ARM is lifted, because the WHITE REFERENCE is not in a position to reflect light to the REFERENCE CHANNEL. The black reference reading must have an A/D value of 0 to 1000 units. If the reading is not within these limits, error code L21 occurs. No test results are given.

Special Tools

None

Possible Replacement Parts

REFLECTOMETER ASSEMBLY 351670
SLIDER CAM 351441
CAM DRIVE MOTOR/GEAR ASSEMBLY 351589
ANALOG BOARD 351461
CONTROLLER BOARD 351460

To Check for Correct Operation:

To check that the problem is repaired, execute the test again. If error code L21 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
- A slide from a preceeding test is in the Read Station.	- Remove the slide.
- The SAPPHIRE WINDOW is broken or dirty, and it reflects light into the REFLECTOMETER.	Clean the SAPPHIRE WINDOW, or install a new REFLECTOMETER ASSEMBLY.
- The SLIDER CAM did not lift the READ ARM when the black reference reading was taken.	Do the Checkout Procedure for Slide Transport System.
- The A/D CONVERTER on the ANALOG BOARD has a malfunction. - The CONTROLLER BOARD has a malfunction.	To calculate new gains: - Move MAIN POWER SWITCH down. - Wait 5 seconds. - move MAIN POWER SWITCH up. Execute option 106 for the 340 nm filter, and check for A/D values of 0 to 1000. If A/D values in error, install a new ANALOG BOARD or CONTROLLER BOARD.

L22 - "RATIO SAMPLE OUT OF RANGE"

Description

In normal operation, each sample reading for a slide must be within the limits of -200 and 32676 A/D units. If the reading is not within the limits, error code L22 occurs. No test results are given.

Special Tools

None

Possible Replacement Parts

FLASH LAMP 337379
FLASH ASSEMBLY 351571
ANALOG BOARD 351461
CONTROLLER BOARD 351460

To Check for Correct Operation:

To check that the problem is repaired, execute the test again. If error code L22 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																																
- Analyte concentration in sample fluid is too high.	- Operator should dilute sample fluid and process test again.																																
- The illumination from the FLASH LAMP is too low.	- Do the Checkout Procedure for the Flash System.																																
- The FLASH POWER SUPPLY has a malfunction.	- Seat CONNECTOR P4.																																
- CONTROLLER BOARD: CONNECTOR P4 is loose or has damage.	- Check that CONNECTOR P4 has correct voltage																																
	<table border="1"> <thead> <tr> <th colspan="4">TL-3577, TL-3578, TL-3424</th> </tr> <tr> <th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr> </thead> <tbody> <tr> <td>CONTROLLER/PIN 1</td><td>E3 or</td><td></td><td>+5 V dc</td></tr> <tr> <td>BOARD - J4</td><td></td><td>TP4</td><td></td></tr> <tr> <td>CONTROLLER/PIN 2</td><td>E3 or</td><td></td><td>+12 V ac</td></tr> <tr> <td>BOARD - J4</td><td></td><td>TP4</td><td></td></tr> <tr> <td>CONTROLLER/PIN 3</td><td>E3 or</td><td></td><td>+12 V ac</td></tr> <tr> <td>BOARD - J4</td><td></td><td>TP4</td><td></td></tr> </tbody> </table>	TL-3577, TL-3578, TL-3424				Location	+	Ground	Voltage	CONTROLLER/PIN 1	E3 or		+5 V dc	BOARD - J4		TP4		CONTROLLER/PIN 2	E3 or		+12 V ac	BOARD - J4		TP4		CONTROLLER/PIN 3	E3 or		+12 V ac	BOARD - J4		TP4	
TL-3577, TL-3578, TL-3424																																	
Location	+	Ground	Voltage																														
CONTROLLER/PIN 1	E3 or		+5 V dc																														
BOARD - J4		TP4																															
CONTROLLER/PIN 2	E3 or		+12 V ac																														
BOARD - J4		TP4																															
CONTROLLER/PIN 3	E3 or		+12 V ac																														
BOARD - J4		TP4																															
- The optics are broken or dirty.	- Do the Checkout Procedure for REFLECTOMETER ASSEMBLY and Optics System. Check WHITE REFERENCE, SAPPHIRE WINDOW.																																
- The A/D CONVERTER on the ANALOG BOARD has a malfunction.	To calculate new gains:																																
- The CONTROLLER BOARD has a malfunction.	- Move MAIN POWER SWITCH down.																																
	- Wait 5 seconds.																																
	- move MAIN POWER SWITCH up.																																
	Execute option 106 for the 340 nm filter, and check for A/D values of -200 to 32676. If A/D values in error, install a new ANALOG BOARD or CONTROLLER BOARD.																																

L23 - "REF VOLTAGE OUT OF RANGE"

When a test is processed, the reading from the SAMPLE PHOTO DIODE on the ANALOG BOARD must be within the following limit:

$$\frac{32676 \times \text{Reference Voltage}}{10 \text{ V dc}} = 26140 \text{ to } 32676 \text{ A/D units}$$

If the result is less than 26140, error code L23 occurs.

Special Tools

MULTIMETER TL-3424
TEST POINT BOARD TL-3577
LOGIC PROBE TL-3008
RIBBON CABLE TL-3624

Possible Replacement Parts

FLASH LAMP 337379
FLASH ASSEMBLY 351571
READ ARM AND HEATER ASSEMBLY 351678
REFLECTOMETER ASSEMBLY 351670

To Check for Correct Operation:

To check that the problem is repaired, execute the test again. If error code L23 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																					
<ul style="list-style-type: none">- The illumination from the FLASH LAMP is too low.- The FLASH POWER SUPPLY has a malfunction.- CONTROLLER BOARD: CONNECTOR J4 is loose or has damage.	<ul style="list-style-type: none">- Do the Checkout Procedure for the Flash System. <p>Check that CONNECTOR J4 operates correctly:</p> <table border="1"><thead><tr><th colspan="4">TL-3577, TL-3578, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr></thead><tbody><tr><td>CONNECTOR J4</td><td>PIN 2</td><td>PIN 3</td><td>24 V dc</td></tr></tbody></table>	TL-3577, TL-3578, TL-3424				Location	+	Ground	Voltage	CONNECTOR J4	PIN 2	PIN 3	24 V dc									
TL-3577, TL-3578, TL-3424																						
Location	+	Ground	Voltage																			
CONNECTOR J4	PIN 2	PIN 3	24 V dc																			
<ul style="list-style-type: none">- The drive signals to the FILTER WHEEL MOTOR have a malfunction:<ul style="list-style-type: none">- CONNECTOR P4 is loose.- The MOTOR is damaged.- The drive signals to the MOTOR are not correct.	<ul style="list-style-type: none">- Do the Checkout Procedure for STEPPER MOTORS and check the FILTER WHEEL MOTOR:<ul style="list-style-type: none">- Seat CONNECTOR P4.- Check MOTOR impedance: <table border="1"><thead><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr></thead><tbody><tr><td>FILTER WHEEL MOTOR</td><td>P4 - SOCKETS 1 and 2</td><td>150 ohms</td></tr><tr><td></td><td>P4 - SOCKETS 4 and 5</td><td>150 ohms</td></tr></tbody></table> <ul style="list-style-type: none">- Energize MAIN POWER SWITCH and check the drive signals:<ul style="list-style-type: none">- Configuration 1 ANALOG BOARD <table border="1"><thead><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr></thead><tbody><tr><td>TL-3577</td><td>PINS 1 to 4</td><td>All pulse</td></tr></tbody></table> <ul style="list-style-type: none">- Configuration 2 ANALOG BOARD: LED D58 on ANALOG BOARD energized	MULTIMETER TL-3424			Location	Connection	Impedance	FILTER WHEEL MOTOR	P4 - SOCKETS 1 and 2	150 ohms		P4 - SOCKETS 4 and 5	150 ohms	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PINS 1 to 4	All pulse
MULTIMETER TL-3424																						
Location	Connection	Impedance																				
FILTER WHEEL MOTOR	P4 - SOCKETS 1 and 2	150 ohms																				
	P4 - SOCKETS 4 and 5	150 ohms																				
TL-3577, TL-3624, TL-3008																						
Location	Connection	Signal																				
TL-3577	PINS 1 to 4	All pulse																				

To Check for Correct Operation:

To check that the problem is repaired, execute the test again. If error code L23 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
- The FILTER WHEEL has binds or damage.	- Do the Checkout Procedure for FILTER WHEEL ASSEMBLY.
- The optics are broken or dirty.	- Do the Checkout Procedure for REFLECTOMETER ASSEMBLY and Optics System.
- The PHOTO DIODES on the ANALOG BOARD have a malfunction.	<p>To calculate new gains:</p> <ul style="list-style-type: none"> - Move MAIN POWER SWITCH down. - Wait 5 seconds. - move MAIN POWER SWITCH up. <p>Execute option 106 for the 340 nm filter, and check for A/D values of 26140 to 32676. If A/D values in error, install a new ANALOG BOARD.</p>

L25 - "WHITE SLIDE OUT OF RANGE"

Description

Error code L25 only occurs when option 103 is executed to calculate Correction Factors. During the calculation of the correction factor for the white reference, the readings from the WHITE REFERENCE SLIDE TL-3575 must produce an A/D signal that is greater than 20000 A/D units, and less than 32676 A/D units. If the reading is beyond these limits, error code L25 occurs.

When the error code occurs, no results are displayed for option 103.

Special Tools

WHITE REFERENCE SLIDE TL-3575
MULTIMETER TL-3424
TEST POINT BOARD TL-3577
LOGIC PROBE TL-3008
RIBBON CABLE TL-3624

Possible Replacement Parts

FILTER WHEEL ENCLOSURE ASSEMBLY 351516
REFLECTOMETER ASSEMBLY 351582
FLASH LAMP 337379
FLASH ASSEMBLY 351571

To Check for Correct Operation:

To check that the problem is repaired, do the Correction Factors procedure again. If error code L25 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																				
- You used the wrong WHITE REFERENCE SLIDE to do the procedure.	- Use WHITE REFERENCE SLIDE TL-3575. WHITE REFERENCE SLIDE TL-3344 is only used with the DT60 ANALYZER.																				
- The WHITE REFERENCE SLIDE is dirty.	- Use a new WHITE REFERENCE SLIDE.																				
- You inserted the WHITE REFERENCE SLIDE in the wrong position.	- Insert the slide with the notch in the front right corner.																				
- Flash System has a malfunction: - FLASH LAMP needs replacement. - FLASH ASSEMBLY or FUSE F1 need replacement. - CONNECTOR J4 to the FLASH ASSEMBLY is loose or has damage. - The flash signal from the CONTROLLER BOARD is not correct. - The flash power supply has a malfunction. FUSES F1, F3, or F4 could need replacement.	- Move MAIN POWER SWITCH up and check if flashes occur. - Do the Checkout Procedure for Flash System. If necessary, check the flash signals: <table border="1"><thead><tr><th colspan="4">MULTIMETER TL-3424</th></tr><tr><th>BOARD</th><th>+</th><th>Ground</th><th>Voltage</th></tr></thead><tbody><tr><td>CONTROLLER J4-1</td><td>E3 or TP4</td><td></td><td>+5 V dc</td></tr><tr><td>CONTROLLER J4-2</td><td>E3 or TP4</td><td></td><td>12 V ac</td></tr><tr><td>CONTROLLER J4-3</td><td>E3 or TP4</td><td></td><td>12 V ac</td></tr></tbody></table> - Install new FUSES if necessary.	MULTIMETER TL-3424				BOARD	+	Ground	Voltage	CONTROLLER J4-1	E3 or TP4		+5 V dc	CONTROLLER J4-2	E3 or TP4		12 V ac	CONTROLLER J4-3	E3 or TP4		12 V ac
MULTIMETER TL-3424																					
BOARD	+	Ground	Voltage																		
CONTROLLER J4-1	E3 or TP4		+5 V dc																		
CONTROLLER J4-2	E3 or TP4		12 V ac																		
CONTROLLER J4-3	E3 or TP4		12 V ac																		
- REFLECTOMETER ASSEMBLY has damage. - Optics dirty or damaged: WHITE REFERENCE SAPPHIRE WINDOW PHOTODIODES	- Do Checkout Procedure for REFLECTOMETER ASSEMBLY and Optics System.																				

To Check for Correct Operation:

To check that the problem is repaired, do the Correction Factors procedure again. If error code L25 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions												
<ul style="list-style-type: none">- The FILTER WHEEL ASSEMBLY is not moving correctly.- Filters are dirty or missing.	<ul style="list-style-type: none">- Do the Checkout Procedure for FILTER WHEEL ASSEMBLY.												
<ul style="list-style-type: none">- The drive signals to the FILTER WHEEL MOTOR have a malfunction:<ul style="list-style-type: none">- CONNECTOR P4 is loose.- The MOTOR is damaged.	<ul style="list-style-type: none">- Do the Checkout Procedure for STEPPER MOTORS and check the FILTER WHEEL MOTOR:<ul style="list-style-type: none">- Seat CONNECTOR P4.- Check MOTOR impedance: <table><tr><th colspan="3">MULTIMETER TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr><tr><td>FILTER WHEEL</td><td>P4 - SOCKETS 1 and 2</td><td>150 ohms</td></tr><tr><td>MOTOR</td><td>P4 - SOCKETS 4 and 5</td><td>150 ohms</td></tr></table>	MULTIMETER TL-3424			Location	Connection	Impedance	FILTER WHEEL	P4 - SOCKETS 1 and 2	150 ohms	MOTOR	P4 - SOCKETS 4 and 5	150 ohms
MULTIMETER TL-3424													
Location	Connection	Impedance											
FILTER WHEEL	P4 - SOCKETS 1 and 2	150 ohms											
MOTOR	P4 - SOCKETS 4 and 5	150 ohms											
<ul style="list-style-type: none">- The drive signals to the MOTOR are not correct.	<ul style="list-style-type: none">- Energize MAIN POWER SWITCH and check the drive signals:<ul style="list-style-type: none">- Configuration 1 ANALOG BOARD <table><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr><tr><td>TL-3577</td><td>PINS 1 to 4</td><td>All pulse</td></tr></table> <ul style="list-style-type: none">- Configuration 2 ANALOG BOARD: LED USB on ANALOG BOARD energized	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PINS 1 to 4	All pulse			
TL-3577, TL-3624, TL-3008													
Location	Connection	Signal											
TL-3577	PINS 1 to 4	All pulse											

See the next page for more information.

To Check for Correct Operation:

To check that the problem is repaired, do the Correction Factors procedure again. If error code L25 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
<ul style="list-style-type: none"> - The PHOTO DIODES on the ANALOG BOARD have a malfunction. 	<ul style="list-style-type: none"> - To calculate new gains: <ul style="list-style-type: none"> - Move MAIN POWER SWITCH down. - Wait 5 seconds. - move MAIN POWER SWITCH up. - Execute option 106 for the 340 nm filter, and check for A/D values of 20000 to 32676. If A/D values in error, install a new ANALOG BOARD.

L26 - "BLACK SLIDE OUT OF RANGE"

Description

Error code L26 only occurs when option 103 is executed to calculate Correction Factors. During the calculation of the correction factor for the black reference, the readings from the BLACK REFERENCE SLIDE TL-3576 must produce an A/D signal that is less than 10000 A/D units. If the reading is higher, error code L26 occurs.

When the error code occurs, no results are displayed for option 103.

Special Tools

BLACK REFERENCE SLIDE TL-3576

To Check for Correct Operation:

To check that the problem is repaired, do the Correction Factors procedure again. If error code L26 does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
- You used the wrong BLACK REFERENCE SLIDE to do the procedure.	- Use BLACK REFERENCE SLIDE TL-3576. BLACK REFERENCE SLIDE TL-3345 is only used with the DT60 ANALYZER.
- The BLACK REFERENCE SLIDE is dirty.	- Use a new BLACK REFERENCE SLIDE.
- You inserted the BLACK REFERENCE SLIDE in the wrong position.	- Insert the slide with the notch in the front right corner.
- The optics are broken or dirty, and reflect light down to the PHOTO DIODES.	- Do the Checkout Procedure for REFLECTOMETER ASSEMBLY and Optics System.
- The PHOTO DIODES on the ANALOG BOARD have a malfunction.	To calculate new gains: - Move MAIN POWER SWITCH down. - Wait 5 seconds. - move MAIN POWER SWITCH up. Execute option 106 for the 340 nm filter, and check for A/D values less than 10000. If A/D values in error, install a new ANALOG BOARD.

L27 - "DTSC COVER OPEN"

Description

If the OPERATOR ACCESS COVER is opened when readings are taken, the room light could cause error in test results. The OPERATOR ACCESS COVER has a MAGNET that makes contact with a HALL EFFECT SENSOR. When the OPERATOR ACCESS COVER is opened, the HALL EFFECT SENSOR BOARD executes a signal that causes error code L27 to occur.

When the COVER is closed, the DTSC MODULE reinitializes. No results are given for any tests that were being processed when the COVER was opened.

If error code L27 occurs when the COVER is closed, a malfunction is indicated.

NOTE

A temporary repair is to enter option 70, which cancels the operation of the monitoring function of the HALL EFFECT SENSOR for the COVER.

If error code L27 does not occur when the COVER is opened, initialize the DTSC MODULE to cancel option 70.

Special Tools

TEST POINT BOARD TL-3577
LOGIC PROBE TL-3008
RIBBON CABLE TL-3624

Possible Replacement Parts

OPERATOR ACCESS COVER 351687
HALL EFFECT SENSOR BOARD 351464
ANALOG BOARD 351461

To Check for Correct Operation:

To check that the problem is repaired, open and close the OPERATOR ACCESS COVER. Error code L27 should occur only when the cover is opened.

Possible Causes	Recommended Actions												
<ul style="list-style-type: none">- The MAGNET is not in the OPERATOR ACCESS COVER.- The MAGNET is installed with the wrong pole in contact with the HALL EFFECT SENSOR.	<ul style="list-style-type: none">- Install a new OPERATOR ACCESS COVER.												
<ul style="list-style-type: none">- The HALL EFFECT SENSOR has a malfunction.- CONNECTOR P10 not seated.- Malfunction of signal	<ul style="list-style-type: none">- Do the Checkout Procedure for HALL EFFECT SENSOR - COVER:<ul style="list-style-type: none">- Seat CONNECTOR J10- Observe LED DS3 on the ANALOG BOARD. LED DS3 should be off when COVER is opened.- Check the voltage for the HALL EFFECT BOARD: <table><tr><th colspan="4">TL-3577, TL-3578, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>TEST POINT BOARD</td><td>TP43</td><td>TP15</td><td>2.50 V dc, COVER open 0 V dc, COVER closed</td></tr></table>	TL-3577, TL-3578, TL-3424				Location	+	Ground	Voltage	TEST POINT BOARD	TP43	TP15	2.50 V dc, COVER open 0 V dc, COVER closed
TL-3577, TL-3578, TL-3424													
Location	+	Ground	Voltage										
TEST POINT BOARD	TP43	TP15	2.50 V dc, COVER open 0 V dc, COVER closed										
<ul style="list-style-type: none">- ENI GASKET prevents the COVER from closing correctly.	<ul style="list-style-type: none">- Tighten the 2 COVER SCREWS and check the position of the COVER.												

"CHEMISTRY NOT IDENTIFIED" "WRONG GENERATION NUMBER"

Description

The first 3 bars of the bar code identify a slide as a rate slide. The message "CHEMISTRY NOT IDENTIFIED" is displayed when the slide has been identified as a rate slide, but the chemistry cannot be determined from the bar code reading. The message "WRONG GENERATION NUMBER" is displayed when the slide has been identified as a rate slide, but the generation number cannot be determined from the bar code reading.

Special Tools

MULTIMETER TL-3424
TEST POINT BOARD TL-3577
LOGIC PROBE TL-3008
RIBBON CABLE TL-3624
BAR CODE SLIDE TL-3385
PUSH-PULL SCALE TL-1079

Possible Replacement Parts

BAR CODE READER BOARD 352463
PROGRAMMED ROM U13 337444 ["Driver Chip" for SLIDE TRANSPORT MOTOR]
SLIDE TRANSPORT MOTOR/GEAR ASSEMBLY 351588
SLIDE TRANSPORT CLIP 351666
SLIDE TRANSPORT BELT 351474
ANALOG BOARD 351461
CONTROLLER BOARD 352251

To Check for Correct Operation:

To check that the problem is repaired, operate the DTSC MODULE with the slides for the same chemistry that had the error. If the error messages do not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions																					
<ul style="list-style-type: none">- Slide not inserted correctly.- The bar code on the slide is not printed correctly.	<ul style="list-style-type: none">- Instruct operator in correct procedure.- Obtain new slides. Obtain information from the CPD Hotline if other slides are not correct.																					
<ul style="list-style-type: none">- The SLIDE TRANSPORT MOTOR moves erratically, causing the motion of the slide under the BAR CODE READER to be wrong. Causes:<ul style="list-style-type: none">- MOTOR malfunction- DRIVER PROM U7 on ANALOG BOARD- CONTROLLER BOARD does not give correct drive signals for SLIDE TRANSPORT MOTOR.	<ul style="list-style-type: none">- Check SLIDE TRANSPORT MOTOR operation. See Checkout Procedure for STEPPER MOTORS. Impedance for MOTOR should be:<table border="1"><thead><tr><th colspan="3">TL-3424</th></tr><tr><th>Location</th><th>Connection</th><th>Impedance</th></tr></thead><tbody><tr><td>MOTOR</td><td>P11- SOCKETS 2 and 3</td><td>150 ohms</td></tr><tr><td>MOTOR</td><td>P11- SOCKETS 5 and 6</td><td>150 ohms</td></tr></tbody></table> <p>Check drive signals from CONTROLLER BOARD during option 108:</p> <table border="1"><thead><tr><th colspan="3">TL-3577, TL-3624, TL-3008</th></tr><tr><th>Location</th><th>Connection</th><th>Signal</th></tr></thead><tbody><tr><td>TL-3577</td><td>PINS 39 to 42</td><td>All pulse</td></tr></tbody></table>	TL-3424			Location	Connection	Impedance	MOTOR	P11- SOCKETS 2 and 3	150 ohms	MOTOR	P11- SOCKETS 5 and 6	150 ohms	TL-3577, TL-3624, TL-3008			Location	Connection	Signal	TL-3577	PINS 39 to 42	All pulse
TL-3424																						
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TL-3577, TL-3624, TL-3008																						
Location	Connection	Signal																				
TL-3577	PINS 39 to 42	All pulse																				
<ul style="list-style-type: none">- Malfunctions in the Slide Transport System cause error in bar code reading.- The BAR CODE READER has a malfunction.	<ul style="list-style-type: none">- Do the Checkout Procedure for the Slide Transport System.- Do the Checkout Procedure for the BAR CODE READER.																					

"RESULTS BELOW ANALYZER RANGE" "RESULTS ABOVE ANALYZER RANGE"

When the results of a test indicate that the quantity of an analyte is too low or too high for the DTSC ANALYZER to measure, the messages "RESULTS ABOVE ANALYZER RANGE" or "RESULTS BELOW ANALYZER RANGE" are displayed on the printout. The Operator's Manual gives the operator instructions for handling the sample if the concentration of analyte is the cause of these messages. If the messages continue to occur after the operator has done the instructions in the Operator's Manual, a malfunction is indicated.

Special Tools

MULTIMETER TL-3424
TEST POINT BOARD TL-3577
LOGIC PROBE TL-3008
RIBBON CABLE TL-3624
WHITE REFERENCE SLIDE TL-3375
BLACK REFERENCE SLIDE TL-3576

Possible Replacement Parts

FLASH LAMP 351458
FLASH ASSEMBLY 351571
PIPETTE
PIPETTE LOCATOR

Additional Information

Operator's Manual

To Check for Correct Operation:

To check that the problem is repaired, operate the DTSC MODULE for the same chemistry that has the error. If the error message does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
- The concentration of analyte is too high or too low.	- See the Operator's Manual.
- The correction factors are wrong or no correction factors.	- Do the Correction Factors procedure.
- The gains are not correct.	- Do the Checkout Procedure for Gains and A/D Values.
- The PIPETTE does not dispense the drop on the center of the slide.	- Do the Checkout Procedure for Metering System and Spotting Station.
- The PIPETTE does not dispense the correct drop volume.	- Check that the operator is using the PIPETTE correctly. - Check the drop volume of the PIPETTE. - Use new TIPS. - Install a replacement BATTERY in the PIPETTE.

"NO DTSC ATTACHED"

Description

This message is displayed when an operator tries to execute an option for the DTSC MODULE, but the DT60 ANALYZER did not receive any handshake communication signal to indicate that a DTSC MODULE is installed. The DTSC MODULE would not have initialized before the message is displayed.

Special Tools

MULTIMETER TL-3424

Possible Replacement Parts

INTERFACE CABLE 351446

To Check for Correct Operation:

To check that the problem is repaired, execute an option for the DTSC MODULE, for example, option 108. If the error message does not occur again, the checkout and repair are completed.

Possible Causes	Recommended Actions
<ul style="list-style-type: none">- The MAIN POWER SWITCH for the DTSC MODULE was not moved to "1".- The INTERFACE CABLE is loose.- The INTERFACE CABLE has a malfunction.	<ul style="list-style-type: none">- Move the MAIN POWER SWITCH.- Tighten the INTERFACE CABLE.- Do the Checkout Procedure for the INTERFACE CABLE.

Precision or Accuracy Errors in Test Results

Description

When test results do not meet customer quality control specifications, or when the CONTROLS have test results that are beyond specifications, do the following procedure.

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424
TIP HEIGHT ADJUSTMENT GAUGE TL-3446
PUSH-PULL SCALE TL-1079
SEALANT TL-2425

Possible Replacement Parts

SLIDE TRANSPORT CLIP 351666
PIPETTE LOCATOR 351567
SLIDE TRANSPORT BELT 351474
SLIDER CAM 351441
READ ARM SPRING 351684
ANALOG BOARD 351461
CONTROLLER BOARD 351460
FLASH LAMP
FLASH ASSEMBLY

Additional Information

Operator's Manual
Reference Guide

NOTE

To check that the malfunction is repaired, process CONTROLS for the chemistries in error. If the results are within specification, the diagnosis and repair are completed.

Possible Causes	Recommended Actions
- Operator does not use correct processing procedures.	- Observe customer operation and instruct in correct procedures.
- The PIPETTE does not operate correctly.	- Check that the PIPETTE aspirates and dispenses drops correctly. Use several TIPS, and check that the fluid aspirates to the correct level. Check that the dispensed drop does not adhere to the TIP. If necessary, order a new PIPETTE, or a replacement BATTERY.
- Drops are not dispensed on the center of the slide	- Do the Checkout Procedure for Slide Transport System, using option 108 to check that the slide is in correct position in the Spotting Station. Check the adjustment for SLIDE TRANSPORT BELT - Tension. - Check the adjustment for TIP - Height.
- The temperature is not correct, but error codes H16 to H19 did not occur.	- Option 70 could be actuated. To cancel, deenergize and then energize the DTSC MODULE and the DT60 ANALYZER. If error codes occur, use diagnostics to repair.

See the next page for more information.

NOTE

To check that the malfunction is repaired, process CONTROLS for the chemistries in error. If the results are within specification, the diagnosis and repair are completed.

Possible Causes	Recommended Actions																				
<ul style="list-style-type: none">- The illumination from the FLASH LAMP is too low.- The FLASH POWER SUPPLY has a malfunction.- CONTROLLER BOARD: CONNECTOR P4 is loose or has damage.	<ul style="list-style-type: none">- Do the Checkout Procedure for the Flash System.- Seat CONNECTOR P4.- Check that CONNECTOR P4 has correct voltage <table><tr><th colspan="4">TL-3577, TL-3578, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>CONTROLLER PIN 1 BOARD - J4 </td><td>E3 or TP4</td><td></td><td>+5 V dc</td></tr><tr><td>CONTROLLER PIN 2 BOARD - J4 </td><td>E3 or TP4</td><td></td><td>+12 V ac</td></tr><tr><td>CONTROLLER PIN 3 BOARD - J4 </td><td>E3 or TP4</td><td></td><td>+12 V ac</td></tr></table>	TL-3577, TL-3578, TL-3424				Location	+	Ground	Voltage	CONTROLLER PIN 1 BOARD - J4	E3 or TP4		+5 V dc	CONTROLLER PIN 2 BOARD - J4	E3 or TP4		+12 V ac	CONTROLLER PIN 3 BOARD - J4	E3 or TP4		+12 V ac
TL-3577, TL-3578, TL-3424																					
Location	+	Ground	Voltage																		
CONTROLLER PIN 1 BOARD - J4	E3 or TP4		+5 V dc																		
CONTROLLER PIN 2 BOARD - J4	E3 or TP4		+12 V ac																		
CONTROLLER PIN 3 BOARD - J4	E3 or TP4		+12 V ac																		
<ul style="list-style-type: none">- The slides or CONTROLS are not within quality control specifications	<ul style="list-style-type: none">- Check the lot numbers with CPD Hotline.																				

Message "SPOT SLIDE WITH FLUID" Remains After Dispensing Drop

Description

In normal operation, after a slide enters the Spotting Station, a 3 second delay occurs to allow the SPOT DETECTOR SENSOR to become stable. After the 3 second delay, the SPOT DETECTOR SENSOR is able to detect the reduction in reflectance that occurs when a drop of fluid is dispensed on the slide. The message "SPOT SLIDE WITH FLUID" is then displayed, and a tone occurs, and the green LED blinks to indicate to the operator that the slide is ready for the drop. After the drop is dispensed, the SPOT DETECTOR SENSOR should detect the change in reflectance from the slide. This change causes the message "SPOT SLIDE WITH FLUID" to clear from the LC DISPLAY, and the green LED to stop blinking.

If the message "SPOT SLIDE WITH FLUID" remains on the LC DISPLAY and the Green LED continues to blink after the drop is dispensed, use this diagnostic procedure.

LED D55 of the ANALOG BOARD is energized when there is no reflectance to the SPOT DETECTOR SENSOR. The normal sequence for LED D55 is:

<u>Condition</u>	<u>LED D55</u>
No slide in Spot Station.	Off. Detects light from TRACK.
Slide enters Spot Station.	Flickers. Detects black and white lines in bar code as slide moves under SPOT DETECTOR SENSOR.
3 second delay.	Off. Detects reflection from white center of slide.
Slide spot.	On. Reduced reflectance from slide.
Slide absorbs drop.	Off.

Special Tools

NH₃ slide
TIP HEIGHT ADJUSTMENT GAUGE TL-3446

Possible Replacement Parts

SPOT DETECTOR ASSEMBLY 351492
ANALOG BOARD 351461

Additional Information

Adjustment procedure for SPOT DETECTOR SENSOR - Voltage

To Check for Correct Operation:

To check that the malfunction is repaired, operate the DTSC MODULE with slides and check that LED D55 operates correctly.

<u>Possible Causes</u>	<u>Recommended Actions</u>
<ul style="list-style-type: none"> - SPOT DETECTOR SENSOR is loose. - CONNECTOR P6 is loose. - Adjustment for SPOT DETECTOR SENSOR - Voltage is wrong. - Adjustment for TIP - Height is wrong. - Intermittent voltage to SPOT DETECTOR SENSOR, CONNECTOR P9. - Spotting signal is not stable. 	<ul style="list-style-type: none"> - See the Checkout Procedure for Metering System and Spotting Station.
<ul style="list-style-type: none"> - The PIPETTE does not operate correctly. 	<ul style="list-style-type: none"> - Check that the PIPETTE aspirates and dispenses drops correctly. Use several TIPS, and check that the fluid aspirates to the correct level. Check that the dispensed drop does not adhere to the TIP. - If necessary, order a new PIPETTE, or a replacement BATTERY.

Calibration is Not Possible

Description

Use this diagnostic procedure when the slide values during the calibration mode do not allow the DT60 ANALYZER to calculate calibration curves for a rate chemistry.

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424
TIP HEIGHT ADJUSTMENT GAUGE TL-3446
PUSH-PULL SCALE TL-1079

Possible Replacement Parts

FLASH LAMP 337379
FLASH ASSEMBLY 351571

Additional Information

Operator's Manual
Reference Guide

NOTE

To check that the malfunction is repaired, calibrate the DTSC MODULE for the chemistries in error. If the results are within specification, the diagnosis and and repair are completed.

Possible Causes	Recommended Actions
- Operator does not use correct processing procedures.	- Observe customer operation and instruct in correct procedures.
- The PIPETTE does not operate correctly.	- Check that the PIPETTE aspirates and dispenses drops correctly. Use several TIPS, and check that the fluid aspirates to the correct level. Check that the dispensed drop does not adhere to the TIP. If necessary, order a new PIPETTE, or a replacement BATTERY.
- Drops are not dispensed on the center of the slide	- Do the Checkout Procedure for Slide Transport System, using option 108 to check that the slide is in correct position in the Spotting Station. Check the adjustment for SLIDE TRANSPORT BELT - Tension. - Check the adjustment for TIP - Height.
- The temperature is not correct, but error codes H16 to H19 did not occur.	- Option 70 could be actuated. To cancel, deenergize and then energize the DTSC MODULE and the DT60 ANALYZER. If error codes occur, use diagnostics to repair.

See the next page for more information.

NOTE

To check that the malfunction is repaired, process CONTROLS for the chemistries in error. If the results are within specification, the diagnosis and repair are completed.

Possible Causes	Recommended Actions																																				
<ul style="list-style-type: none">- The illumination from the FLASH LAMP is too low.- The FLASH POWER SUPPLY has a malfunction.- CONTROLLER BOARD: CONNECTOR P4 is loose or has damage.	<ul style="list-style-type: none">- Do the Checkout Procedure for the Flash System.- Seat CONNECTOR P4.- Check that CONNECTOR P4 has correct voltage <table><tr><th colspan="4">TL-3577, TL-3578, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td colspan="4">-----</td></tr><tr><td>CONTROLLER/PIN 1</td><td>E3 or</td><td></td><td>+5 V dc</td></tr><tr><td>BOARD - J4</td><td></td><td>TP4</td><td></td></tr><tr><td>CONTROLLER/PIN 2</td><td>E3 or</td><td></td><td>+12 V ac</td></tr><tr><td>BOARD - J4</td><td></td><td>TP4</td><td></td></tr><tr><td>CONTROLLER/PIN 3</td><td>E3 or</td><td></td><td>+12 V ac</td></tr><tr><td>BOARD - J4</td><td></td><td>TP4</td><td></td></tr></table>	TL-3577, TL-3578, TL-3424				Location	+	Ground	Voltage	-----				CONTROLLER/PIN 1	E3 or		+5 V dc	BOARD - J4		TP4		CONTROLLER/PIN 2	E3 or		+12 V ac	BOARD - J4		TP4		CONTROLLER/PIN 3	E3 or		+12 V ac	BOARD - J4		TP4	
TL-3577, TL-3578, TL-3424																																					
Location	+	Ground	Voltage																																		

CONTROLLER/PIN 1	E3 or		+5 V dc																																		
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BOARD - J4		TP4																																			
CONTROLLER/PIN 3	E3 or		+12 V ac																																		
BOARD - J4		TP4																																			
<ul style="list-style-type: none">- The slides or CONTROLS are not within quality control specifications	<ul style="list-style-type: none">- Check the lot numbers with CPD Hotline.																																				
<ul style="list-style-type: none">- No correction factors or wrong correction factors.	<ul style="list-style-type: none">- Use option 50 to check correction factors.- Do the Correction Factors Procedure.- Do DR Procedure to check correction factors.																																				

Drops Are Not in the Centers of the Slides

Description

If the sample fluid drop is not dispensed in the center of the slide, test results might not be accurate or precise. Use the following diagnostic procedure.

Special Tools

TIP HEIGHT ADJUSTMENT GAUGE TL-3446
PUSH-PULL SCALE TL-1079
SEALANT TL-2425

Possible Replacement Parts

SLIDE TRANSPORT CLIP 351666
PREHEAT PLATEN ASSEMBLY 351566
PIPETTE LOCATOR 351567
SLIDE TRANSPORT BELT 351474
SLIDE TRANSPORT MOTOR ASSEMBLY 351588
ANALOG BOARD 351461
INTEGRATED CIRCUIT FROM U7 337444 on ANALOG BOARD
CONTROLLER BOARD 351460

NOTE

To check that the malfunction is repaired, process CONTROLS for the chemistries in error. If the results are within specification, the diagnosis and repair are completed.

Possible Causes	Recommended Actions
- Operator does not use correct processing procedures.	- Observe customer operation and instruct in correct procedures.
- The PIPETTE does not operate correctly. - The TIPS are not made correctly.	- Check that the PIPETTE aspirates and dispenses drops correctly. Use several TIPS, and check that the fluid aspirates to the correct level. Check that the dispensed drop does not adhere to the TIP. If necessary, order a new PIPETTE, or a replacement BATTERY.
- The slide does not advance to the Spotting Station correctly.	- Do the Checkout Procedure for Slide Transport System, using option 108 to check that the slide is in correct position in the Spotting Station. Check the adjustment for SLIDE TRANSPORT BELT - Tension.
- The adjustment for TIP-Height is not correct.	- Check the adjustment for TIP - Height.

No "DTSC MODULE READY" Message After 5 Minutes

Description

During the initialization sequence, the DTSC MODULE should reach operating temperature after 5 minutes. In normal operation, the message "DTSC MODULE READY" will then be displayed to indicate that the DT60 ANALYZER received a handshake communication signal to indicate that a DTSC MODULE is ready. If the operators tries to insert a slide before the message "DTSC MODULE" is displayed, the equipment will execute no response. The message "NO DTSC ATTACHED" will be displayed if displayed if an operator tries to execute an option for the DTSC MODULE, but the DT60 ANALYZER did not received the handshake communication signal.

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
LOGIC PROBE TL-3008
MULTIMETER TL-3424

Possible Replacement Parts

PREHEAT PLATEN ASSEMBLY 351566
ANALOG BOARD 351461
CONTROLLER BOARD 351460
FUSE 337490
INTERFACE CABLE 351446
OPERATOR ACCESS COVER 351678

NOTE

To check that the malfunction is repaired, energize the DTSC MODULE, and check that the initialization is complete, and that the message "DTSC MODULE READY" is displayed after 5 minutes.

Possible Causes	Recommended Actions												
<ul style="list-style-type: none">- The COVER is open.	<ul style="list-style-type: none">- Close the COVER.												
<ul style="list-style-type: none">- The MAGNET is not in the OPERATOR ACCESS COVER.- The MAGNET is installed with the wrong pole in contact with the HALL EFFECT SENSOR.	<ul style="list-style-type: none">- Install a new OPERATOR ACCESS COVER.												
<ul style="list-style-type: none">- The HALL EFFECT SENSOR has a malfunction.- CONNECTOR P10 not seated.- Malfunction of signal	<ul style="list-style-type: none">- Do the Checkout Procedure for HALL EFFECT SENSOR - COVER:<ul style="list-style-type: none">- Seat CONNECTOR J10- Observe LED DS3 on the ANALOG BOARD. LED DS3 should be off when COVER is opened.- Check the voltage for the HALL EFFECT BOARD:<table><tr><th colspan="4">TL-3577, TL-3578, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>TEST POINT BOARD</td><td>TP43</td><td>TP15</td><td>2.5+.1 V dc, COVER open 0+.1 V dc, COVER closed</td></tr></table>	TL-3577, TL-3578, TL-3424				Location	+	Ground	Voltage	TEST POINT BOARD	TP43	TP15	2.5+.1 V dc, COVER open 0+.1 V dc, COVER closed
TL-3577, TL-3578, TL-3424													
Location	+	Ground	Voltage										
TEST POINT BOARD	TP43	TP15	2.5+.1 V dc, COVER open 0+.1 V dc, COVER closed										
<ul style="list-style-type: none">- EMI GASKET prevents the COVER from closing correctly.	<ul style="list-style-type: none">- Tighten the 2 COVER SCREWS and check the position of the COVER.												
<ul style="list-style-type: none">- The INTERFACE CABLE is loose.- The INTERFACE CABLE has a malfunction.	<ul style="list-style-type: none">- Tighten the INTERFACE CABLE.- Do the Checkout Procedure for the INTERFACE CABLE.												

NOTE

To check that the malfunction is repaired, energize the DTSC MODULE, and check that the initialization is complete, and that the message "DTSC MODULE READY" is displayed after 5 minutes.

Possible Causes	Recommended Actions
- The HEATERS or THERMISTORS have a malfunction. The equipment cannot reach operating temperature.	- Do the Checkout Procedure for Temperature Too Low.
- FUSE F1 on the CONTROLLER BOARD is not operating.	<ul style="list-style-type: none"> - Denergize the DTSC MODULE. - Install a new FUSE F1 on the CONTROLLER BOARD - Disconnect CONNECTOR P9 from the ANALOG BOARD - Energize the DTSC MODULE. - If the FUSE F1 malfunctions again, install a new CONTROLLER BOARD. - If FUSE F1 operates correctly, locate a short circuit in a component using +5 V dc power, for example, the HALL EFFECT BOARD or SPOT DETECTOR SENSOR. Install a new component.

Gains Are Too High But Within Limits

Description

The recommended gains are 20 for a new FLASH LAMP, and 30 for an older FLASH LAMP. The diagnostic software could allow for higher gains, so error code L15, "GAIN OUT OF LIMITS" might not occur. Do the following diagnostic procedure if high gains are indicated.

Use option 50 to obtain a printout of the gains in use.

Special Tools

MULTIMETER TL-3424
TEST POINT BOARD TL-3577
LOGIC PROBE TL-3008
RIBBON CABLE TL-3624

Possible Replacement Parts

FLASH LAMP 337379
FLASH ASSEMBLY 351571
CONTROLLER BOARD 351460
READ ARM AND HEATER ASSEMBLY 351678
REFLECTOMETER ASSEMBLY 351670
ANALOG BOARD 351461
In DT60 ANALYZER: CPU BOARD

To Check for Correct Operation:

To check that the malfunction is repaired, execute option 50 and check that gains are less than 20 for a new FLASH LAMP, and less than 30 for an old FLASH LAMP.

Possible Causes	Recommended Actions																				
<ul style="list-style-type: none"> - The illumination from the FLASH LAMP is too low. - The FLASH POWER SUPPLY has a malfunction. - CONTROLLER BOARD: CONNECTOR P4 is loose or has damage. 	<ul style="list-style-type: none"> - Do the Checkout Procedure for the Flash System. - Seat CONNECTOR P4 on CONTROLLER BOARD. - Check that CONNECTOR P4 has correct voltage <table border="1"> <thead> <tr> <th colspan="4">TL-3577, TL-3578, TL-3424</th></tr> <tr> <th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr> </thead> <tbody> <tr> <td>CONTROLLER BOARD - J4</td><td>PIN 1</td><td>E3 or TP4</td><td>+5 V dc</td></tr> <tr> <td>CONTROLLER BOARD - J4</td><td>PIN 2</td><td>E3 or TP4</td><td>+12 V ac</td></tr> <tr> <td>CONTROLLER BOARD - J4</td><td>PIN 3</td><td>E3 or TP4</td><td>+12 V ac</td></tr> </tbody> </table>	TL-3577, TL-3578, TL-3424				Location	+	Ground	Voltage	CONTROLLER BOARD - J4	PIN 1	E3 or TP4	+5 V dc	CONTROLLER BOARD - J4	PIN 2	E3 or TP4	+12 V ac	CONTROLLER BOARD - J4	PIN 3	E3 or TP4	+12 V ac
TL-3577, TL-3578, TL-3424																					
Location	+	Ground	Voltage																		
CONTROLLER BOARD - J4	PIN 1	E3 or TP4	+5 V dc																		
CONTROLLER BOARD - J4	PIN 2	E3 or TP4	+12 V ac																		
CONTROLLER BOARD - J4	PIN 3	E3 or TP4	+12 V ac																		
<ul style="list-style-type: none"> - The optics are broken or dirty. 	<ul style="list-style-type: none"> - Do the Checkout Procedure for REFLECTOMETER ASSEMBLY and Optics System. Check WHITE REFERENCE, SAPPHIRE WINDOW. 																				
<ul style="list-style-type: none"> - The SLIDER CAM does not move the WHITE REFERENCE to the correct position at the correct time when calculating gains. 	<ul style="list-style-type: none"> - Do the Checkout Procedure for the Slide Transport System. - Do the Checkout Procedure for the STEPPER MOTORS. Execute option 111 and check the drive signals for the CAM DRIVE MOTOR: <table border="1"> <thead> <tr> <th colspan="3">TL-3577, TL-3578, TL-3008</th></tr> <tr> <th>Location</th><th>Connection</th><th>Signal</th></tr> </thead> <tbody> <tr> <td>TL-3577</td><td>PINS 35 to 38</td><td>All pulse</td></tr> </tbody> </table>	TL-3577, TL-3578, TL-3008			Location	Connection	Signal	TL-3577	PINS 35 to 38	All pulse											
TL-3577, TL-3578, TL-3008																					
Location	Connection	Signal																			
TL-3577	PINS 35 to 38	All pulse																			
<ul style="list-style-type: none"> - The ANALOG or CONTROLLER BOARDS have malfunctions. 	<ul style="list-style-type: none"> - Seat CONNECTORS. If necessary, install new ANALOG or CONTROLLER BOARDS. 																				

Green LED Does Not Blink When "SPOT SLIDE WITH FLUID" is Displayed

Description

In normal operation, after a slide enters the Spotting Station, a 3 second delay occurs to allow the SPOT DETECTOR SENSOR to become stable. After the 3 second delay, the SPOT DETECTOR SENSOR is able to detect the reduction in reflectance that occurs when a drop of fluid is dispensed on the slide. The message "SPOT SLIDE WITH FLUID" is then displayed, and a tone occurs, and the green LED blinks to indicate to the operator that the slide is ready for the drop.

If the green LED does not blink when the message is displayed, use this diagnostic procedure.

Special Tools

TEST POINT BOARD TL-3577
RIBBON CABLE TL-3624
MULTIMETER TL-3424

Possible Replacement Parts

Green LED 483834
CLIPLITE 337427
FUSE 337488
FUSE 337490
ANALOG BOARD 351461
CONTROLLER BOARD 351460

To Check for Correct Operation:

To check that the malfunction is repaired, load slides in the Run Mode and check that the Green LED operates correctly.

Possible Causes	Recommended Actions									
<ul style="list-style-type: none"> - CONNECTOR P8 for the Green LED is not seated. - The Green LED is not in the CLIPLITE. - The Green LED is not in the LENS. 	<ul style="list-style-type: none"> - Seat CONNECTOR P8 on the ANALOG BOARD. - Insert the Green LED in the CLIPLITE. - Insert the Green LED in the LENS. - Order new parts if necessary. 									
<ul style="list-style-type: none"> - The voltage to CONNECTOR P8 is not correct. 	<ul style="list-style-type: none"> - Check the voltage: <table border="1"> <tr> <th colspan="3">MULTIMETER TL-3424</th> </tr> <tr> <th>BOARD</th><th>Connection</th><th>Voltage</th> </tr> <tr> <td>ANALOG</td><td>J8 - PIN 3</td><td>+5 v dc</td> </tr> </table> <p>The voltage should energize and deenergize when "SPOT SLIDE WITH FLUID" is displayed. If the voltage is correct, install a new CLIPLITE and Green LED. If the voltage is not correct:</p> <ul style="list-style-type: none"> - Check the 5 FUSES on the CONTROLLER BOARD for continuity. Install new FUSES if necessary. 	MULTIMETER TL-3424			BOARD	Connection	Voltage	ANALOG	J8 - PIN 3	+5 v dc
MULTIMETER TL-3424										
BOARD	Connection	Voltage								
ANALOG	J8 - PIN 3	+5 v dc								

See the next page for more information.

To Check for Correct Operation:

To check that the malfunction is repaired, load slides in the Run Mode and check that the Green LED operates correctly.

Possible Causes	Recommended Actions																
- Voltage from CONTROLLER BOARD not correct.	- Use MULTIMETER TL-3424, RIBBON CABLE TL-3624, and TEST POINT BOARD TL-3577 to check: <table><tr><th colspan="4">TL-3577, TL-3624, TL-3424</th></tr><tr><th>Location</th><th>+</th><th>Ground</th><th>Voltage</th></tr><tr><td>TEST POINT BOARD</td><td>PIN 15</td><td>PIN 17</td><td>+5 V dc constant</td></tr><tr><td>TEST POINT BOARD</td><td>PIN 15</td><td>PIN 16</td><td>+5 V dc when message is displayed</td></tr></table>	TL-3577, TL-3624, TL-3424				Location	+	Ground	Voltage	TEST POINT BOARD	PIN 15	PIN 17	+5 V dc constant	TEST POINT BOARD	PIN 15	PIN 16	+5 V dc when message is displayed
TL-3577, TL-3624, TL-3424																	
Location	+	Ground	Voltage														
TEST POINT BOARD	PIN 15	PIN 17	+5 V dc constant														
TEST POINT BOARD	PIN 15	PIN 16	+5 V dc when message is displayed														
	If voltages are correct, install a new ANALOG BOARD. If voltages are not correct, install a new CONTROLLER BOARD.																

No Response When Slide is Inserted

Description

When the DTSC MODULE has initialized correctly, the message "DTSC MODULE READY" will be displayed. If the message is displayed, but an inserted slide does not cause the SLIDE TRANSPORT CLIP to move to the Pickup Station, do the following diagnostic procedure.

Special Tools

BAR CODE SLIDE TL-3385
MULTIMETER TL-3424

Possible Replacement Parts

BAR CODE READER 351463
CONTROLLER BOARD 351460
ANALOG BOARD 351461

To Check for Correct Operation:

To check that the problem is repaired, insert slides in run mode and see if the equipment operates correctly.

Possible Causes	Recommended Actions
- BAR CODE READER is not adjusted correctly.	- Adjust the BAR CODE READER - Voltage.
- CONNECTOR P7 for the BAR CODE READER is loose.	- Seat CONNECTOR P7 on the ANALOG BOARD.
- The BAR CODE READER has a malfunction.	- Do the Checkout Procedure for BAR CODE READER. Check that LED D55 on the ANALOG energizes and deenergizes correctly.

Checkout Procedure for Slide Transport System

[1] Lift the OPERATOR ACCESS COVER.

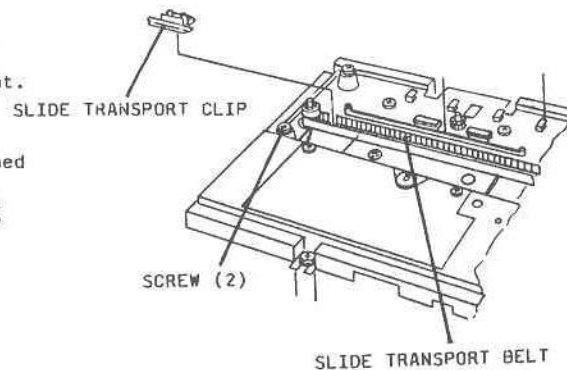
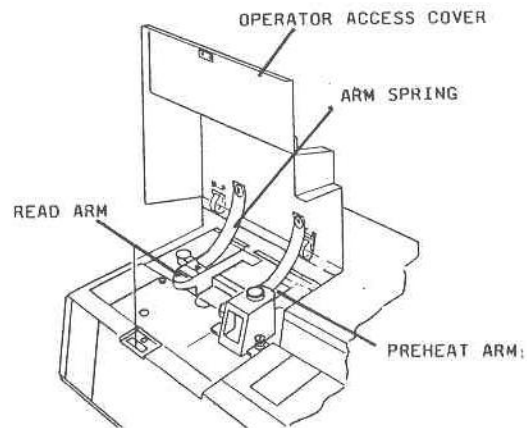
[2] Check that the ARM SPRINGS on the READ ARM and PREHEAT ARM are attached to the ARMS and to the OPERATOR ACCESS COVER correctly.

[3] Check that the ARM SPRINGS are not bent. The ARM SPRINGS must move freely. Install new ARM SPRINGS if necessary.

[4] Check the slide stations and clear any slide jams.

[5] Check that the 2 SCREWS holding the SLIDE TRANSPORT MOTOR are tight.

[6] Check that the SLIDE TRANSPORT CLIP is attached correctly to the SLIDE TRANSPORT BELT. Connect the SLIDE TRANSPORT CLIP if necessary.

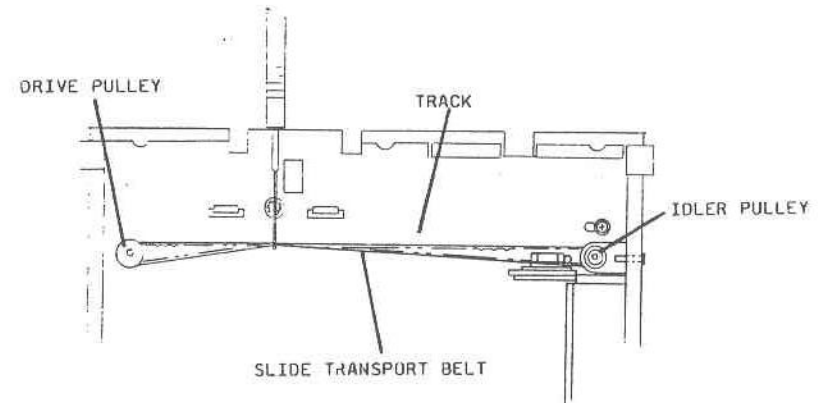


[7] Check that the SLIDE TRANSPORT BELT is engaged correctly by the MOTOR PULLEY and the IDLER PULLEY.

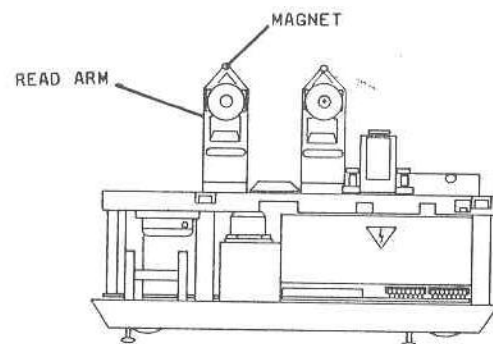
[8] Check that the SLIDE TRANSPORT BELT does not touch the TRACK.

[9] Check that the following adjustment is correct:

Adjustment
SLIDE TRANSPORT BELT - Tension



- [10] Check that the MAGNET is set in the READ ARM. Install a new READ ARM AND HEATER ASSEMBLY 351678 if necessary.

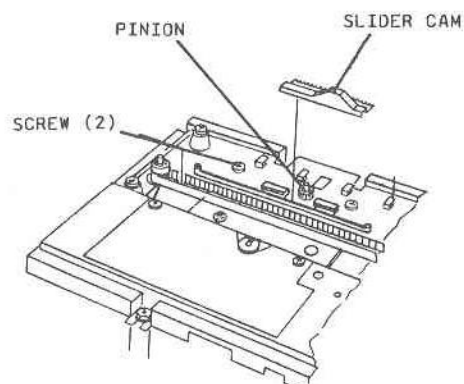


- [11] Check if the SLIDER CAM is broken. Install a new SLIDER CAM 352441 if necessary.

- [12] Check if the PINION has damage. Install a new PINION ASSEMBLY/CAM DRIVE MOTOR 351589 if necessary.

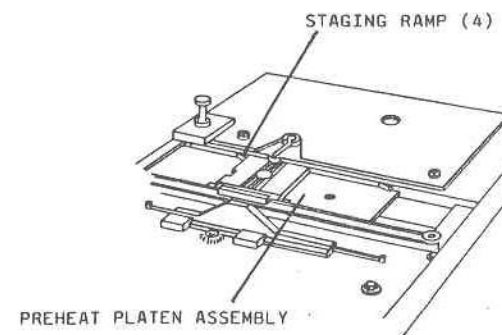
- [13] Check that the 2 SCREWS holding the PINION ASSEMBLY/CAM DRIVE MOTOR are tight.

- [14] Enter options 110 and 111 and check that the SLIDER CAM lifts the ARMS to the correct height.



- [15] Do the following procedure to check that the slide seats correctly at the STAGING RAMPS:

- Enter option 70 to cancel the monitoring functions for COVER and temperature.
- Lift the OPERATOR ACCESS COVER about 30° to observe operation.
- Insert a slide at the Pickup Station.
- Enter option 108.
- Press "enter" and observe the motion of the slide.
- Continue to press "enter" and check that the slide seats correctly at the 4 STAGING RAMPS.
- If the STAGING RAMPS have damage, install a new PIPETTE LOCATOR 351567 or PREHEAT PLATEN ASSEMBLY 351566.



[16] Do the following procedure 5 times to check for correct operation of the Slide Transport System:

- Move the OPERATOR ACCESS COVER down.
- Enter option 107.
- Insert a slide into the Pickup Station.
- Check that the slide moves without obstruction through all stations.

[17] If the slide did not move correctly in step 14, see the diagnostics and continue to check other "Possible Causes" for the malfunction.

Checkout Procedure for STEPPER MOTORS

This procedure gives complete procedures for diagnosing the operations of the 3 STEPPER MOTORS: the FILTER WHEEL MOTOR, the SLIDE TRANSPORT MOTOR, and the SLIDER CAM MOTOR. It is necessary to check only the components related to the STEPPER MOTOR you are diagnosing.

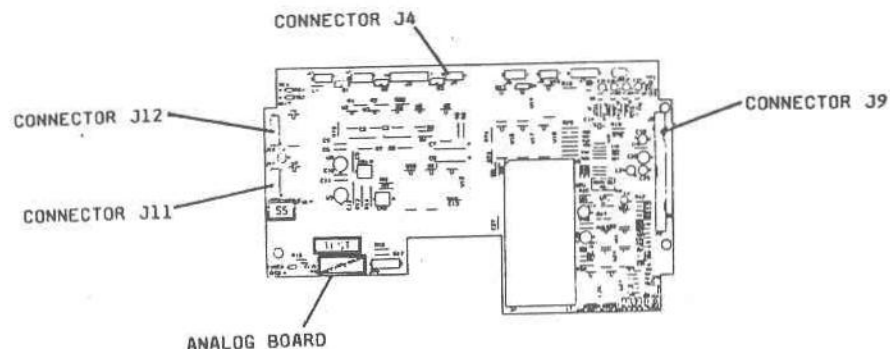
[1] Check that the CONNECTORS are seated correctly on the ANALOG BOARD:

- CONNECTOR J4, for the FILTER WHEEL MOTOR
- CONNECTOR J11, for the SLIDE TRANSPORT MOTOR
- CONNECTOR J12, for the SLIDER CAM MOTOR
- CONNECTOR J9, for the RIBBON CABLE to the CONTROLLER BOARD.

[2] Check for correct operation.



The procedure is completed. Advance to step 3.



[3] Use MULTIMETER TL-3424 to check the impedance of the STEPPER MOTORS:

NOTE

An impedance of approximately 0 ohms indicates a short-circuit.
An impedance measurement at maximum indicates a break in the circuit.

For CONNECTOR P4, FILTER WHEEL MOTOR:

MULTIMETER TL-3424		
Location	Connection	Impedance
CONNECTOR P4	SOCKETS 1 and 2	150 ohms
	SOCKETS 4 and 5	150 ohms

For CONNECTOR P11, SLIDE TRANSPORT MOTOR:

MULTIMETER TL-3424		
Location	Connection	Impedance
CONNECTOR P11	SOCKETS 2 and 3	150 ohms
	SOCKETS 5 and 6	150 ohms

For CONNECTOR P12, CAM DRIVE MOTOR:

MULTIMETER TL-3424		
Location	Connection	Impedance
CONNECTOR P12	SOCKETS 5 and 6	150 ohms
	SOCKETS 2 and 3	150 ohms

[4] Is the impedance correct?



Advance to
step 6.

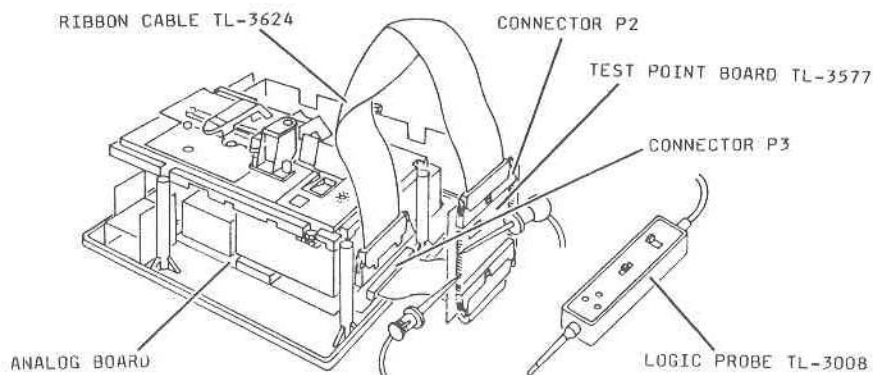


Advance to
step 5.

[5] Install a new STEPPER MOTOR. See Section 10, Parts/Removals.

[6] Do the following procedure to check the drive signals from the CONTROLLER BOARD:

- Connect the RIBBON CABLE TL-3624 to CONNECTOR P2 on the TEST POINT BOARD TL-3577. Bend the RIBBON CABLE. See the figure.
- Connect the other end of the RIBBON CABLE to CONNECTOR P3 from the CONTROLLER BOARD.
- To obtain power for the LOGIC PROBE TL-3008, connect it to the TEST POINT BOARD TL-3577:
 - Connect the black wire to PIN 15 for ground
 - Connect the other wire to PIN 17 for power



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- Use the LOGIC PROBE TL-3008 and execute options to check the signals:

For SLIDE TRANSPORT MOTOR, execute option 109 and check:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PINS 39, 40	All
	41, 42	pulse

For CAM DRIVE MOTOR, execute option 111, and check:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PINS 35, 36	All
	37, 38	pulse

For FILTER WHEEL MOTOR, execute option 105, and check:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PINS 1, 2,	All
	3, 4	pulse

NOTE

If error code F33 has occurred, access to options will not be possible. Move the MAIN POWER SWITCH up and down when necessary to check the signals.

[7] Are the signals pulsing?



Advance to
step 8.



Advance to
step 9.

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[8] Install new DRIVER INTEGRATED CIRCUITS 337444 on the ANALOG BOARD:

- U7 for SLIDE TRANSPORT MOTOR
- U1 for SLIDER CAM MOTOR
- U13 for FILTER WHEEL MOTOR

[9] Check to see if the malfunction is repaired.



The procedure is completed. Advance to step 10.

[10] Install a new ANALOG BOARD. See Section 10, Parts/Removals. This procedure is completed.

[11] If one or more pulses are missing, install a new CONTROLLER BOARD 351460.

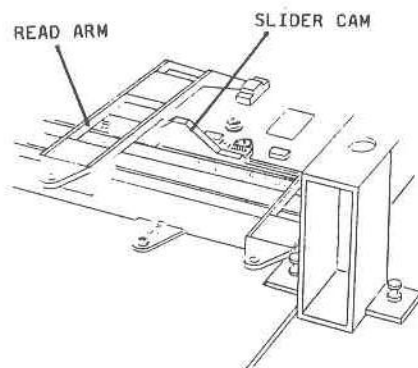
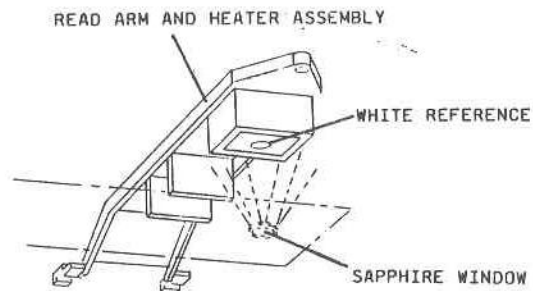
Checkout Procedure for REFLECTOMETER ASSEMBLY and Optics System

- [1] Clean the WHITE REFERENCE with alcohol. If necessary, install a new READ ARM AND HEATER ASSEMBLY 351576.

- [2] Clean the SAPPHIRE WINDOW with alcohol.

- [3] If the SAPPHIRE WINDOW is broken, install a new REFLECTOMETER ASSEMBLY 351670.

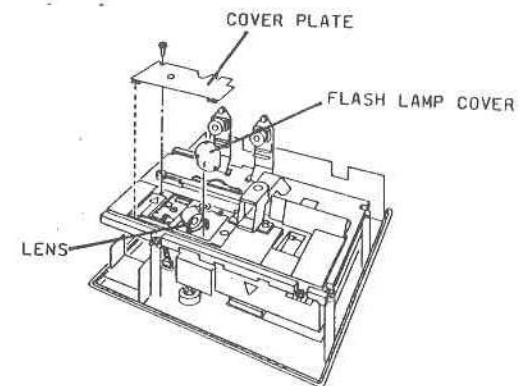
- [4] Execute option 110 and check that the READ ARM is lifted correctly by the SLIDER CAM.



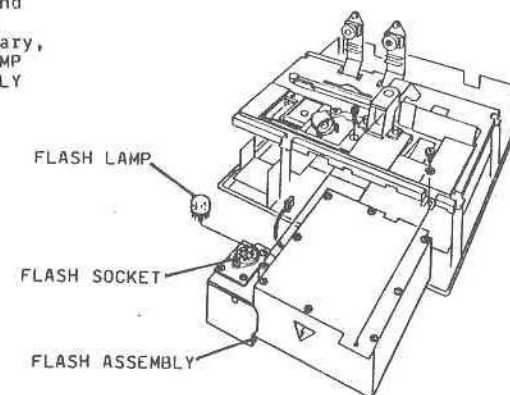
- [5] Remove:

- COVER PLATE
- FLASH LAMP COVER.

- [6] If necessary, clean the LENS with a dry swab.



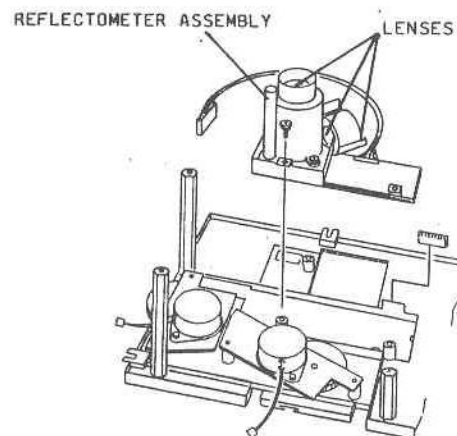
- [7] Check the FLASH LAMP and FLASH SOCKET for brown heat marks. If necessary, install a new FLASH LAMP 337379 or FLASH ASSEMBLY 351571.



NOTE

Do not remove the REFLECTOMETER ASSEMBLY except if you must remove it for other procedures. If you do remove the REFLECTOMETER ASSEMBLY, advance to step 8.

- [8] Clean the LENSES in the REFLECTOMETER ASSEMBLY with a dry swab. Use alcohol or warm water only if necessary.

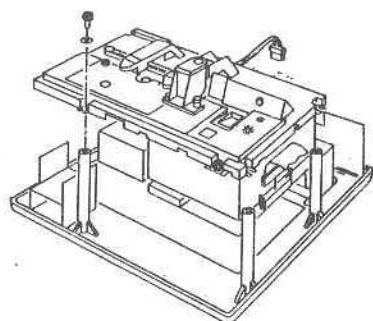


Checkout Procedure for FILTER WHEEL ASSEMBLY

- [1] Remove the ANALOG BOARD.
See Section 10,
Parts/Removals.

- [2] Do the following to remove
the FILTER WHEEL ENCLOSURE
ASSEMBLY:

- Remove the 4 SCREWS.
- Disconnect CONNECTOR P4
from the ANALOG BOARD.
- Remove the FILTER WHEEL
ENCLOSURE ASSEMBLY.



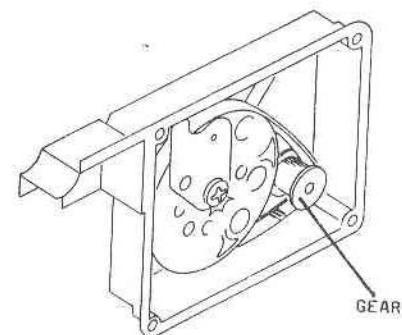
- [3] Manually rotate the GEAR
and check for mechanical
binds.



Advance to
step 8.



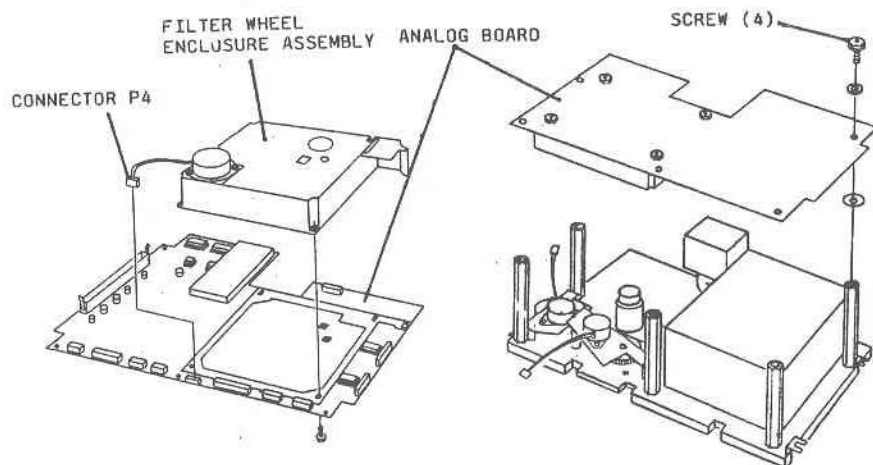
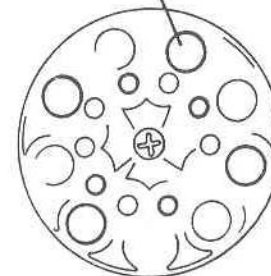
Advance to
step 4.



- [4] Check for dirty filters,
for filters that have
damage, and for empty
filter positions.

- [5] If necessary, clean the
filters with a dry swab.

Filter



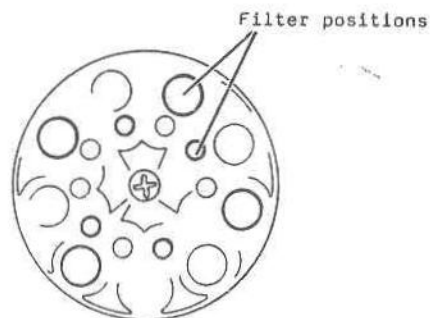
- [6] Are any filter positions empty or do any filters have damage?



Advance to step 8.



Advance to step 7.



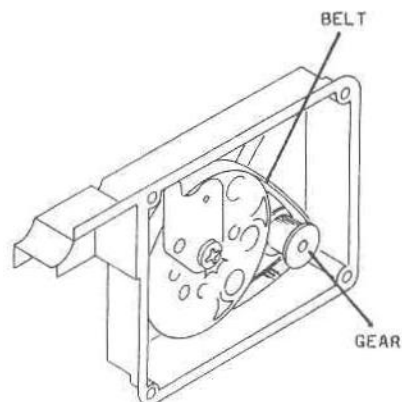
- [7] Manually rotate the GEAR and check that the BELT is fully engaged with the GEAR and the FILTER WHEEL.



Advance to step 9.



Advance to step 8.



- [8] Install a new FILTER WHEEL ENCLOSURE ASSEMBLY. Advance to step 10.

- [9] Install the FILTER WHEEL ENCLOSURE ASSEMBLY.

- [10] Connect CONNECTOR P4 on the ANALOG BOARD.

- [11] Install the 4 SCREWS.

- [12] Install the ANALOG BOARD.

- [13] Install all the parts that you removed.

- [14] Execute option 112 to clear the old filter positions from the NONVOLATILE RAM.

- [15] To obtain new gains:

- Move the MAIN POWER SWITCH down to the "0" position.
- Wait 3 seconds.
- Move the MAIN POWER SWITCH up to the "1" position.

- [16] Do the Correction Factors Procedure. See Section 9, Special Procedures.

Checkout Procedure for BAR CODE READER

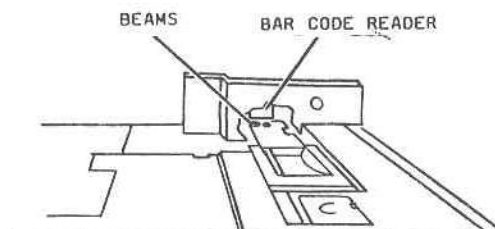
- [1] Check that the BAR CODE READER emits 2 red beams.



Advance to step 13.



Advance to step 2.



- [2] Seat CONNECTORS on CONNECTOR J7 and J9 of the ANALOG BOARD.

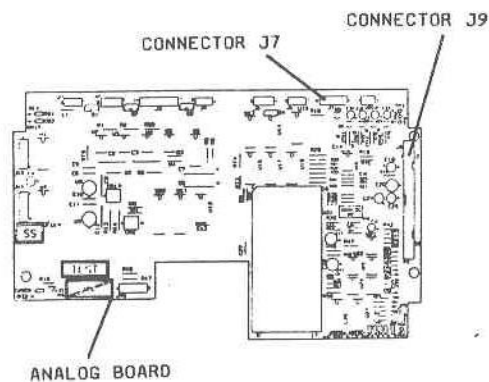
- [3] Are the red beams visible now?



Advance to step 13.



Advance to step 4.



- [4] Check for +15 V dc on the CONTROLLER BOARD:

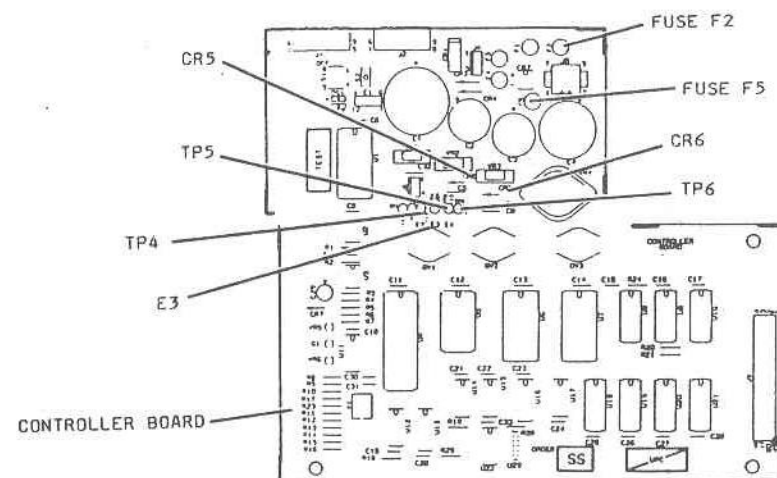
MULTIMETER TL-3424			
Location	+	Ground	Voltage
CONTROLLER BOARD	TP5 or CR5, anode	TP4 or E3	+15 V dc



Advance to step 5.



Advance to step 6.



[5] Check for -15 V dc on the CONTROLLER BOARD:

MULTIMETER TL-3424			
Location	+	Ground	Voltage
CONTROLLER BOARD	TP6 or CR6,	TP4 or E3 cathode	-15 V dc



Advance to step 9.



Advance to step 6.

[6] Check FUSES F5 and F2 on CONTROLLER BOARD for continuity. Install new FUSES if necessary.

[7] Are the red beams visible now?



The procedure is completed.



Advance to step 8.

[8] Install a new CONTROLLER BOARD and check for correct operation. The procedure is completed.

[9] Check for voltages on the BAR CODE READER BOARD:

MULTIMETER TL-3424			
Location	Ground	+	Voltage
BAR CODE READER BOARD	TP4 or E3 on the CONTROLLER BOARD	U2-P8	+15 V dc
		U2-P4	-15 V dc



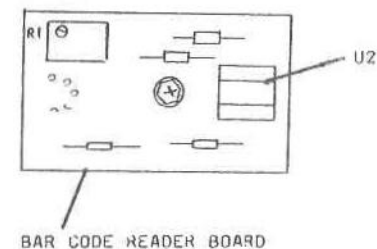
Advance to step 10.



Advance to step 22.

[10] Do the following adjustment:

Adjustment
BAR CODE READER - Voltage



[11] Does the BAR CODE READER identify slides correctly now?



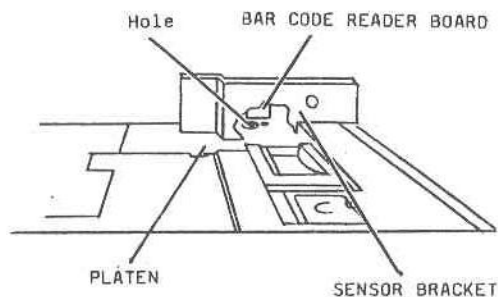
The procedure is completed. Advance to step 12.

[12] Install and adjust a new BAR CODE READER BOARD. The procedure is completed.

[13] Do the following adjustment procedure:

Adjustment
BAR CODE READER - Voltage

[14] Check that one of the red beams enters the hole in the PLATEN. If necessary, move the SENSOR BRACKET to align the beam with the hole.



[15] Remove the COVER.

[16] Check that SCREW holding the BAR CODE READER BOARD is tight.

[17] Check that SLIDE STOP moves without obstruction.

[18] Check that CONNECTOR P7 is seated correctly on the ANALOG BOARD.

[19] Do the following procedure to check if the signal from the BAR CODE READER is transferred to the ANALOG BOARD correctly:

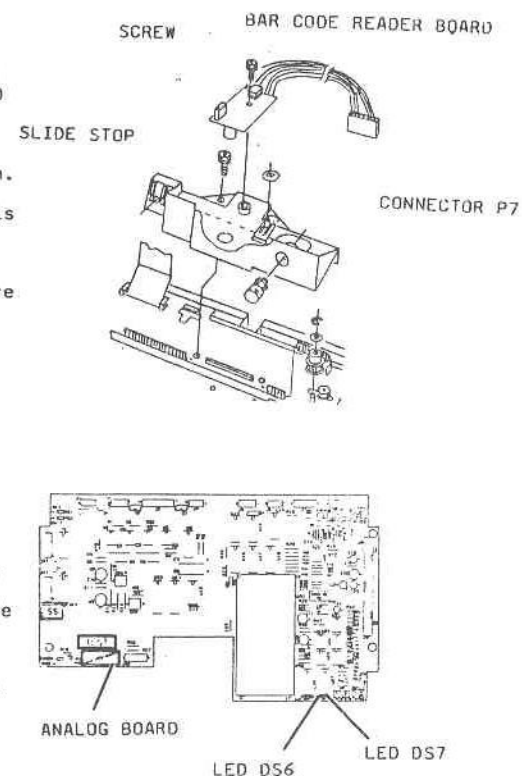
- Insert a slide in the Pickup Station, and observe if LED DS6 energizes.
- Remove the slide from the Pickup Station and observe if LED DS6 deenergizes.
- Move the slide manually under the BAR CODE READER with the Bar Code up, and observe if LED DS7 flickers.
- Do LEDS DS6 and DS7 energize and deenergize correctly?



Advance to step 20.



Advance to step 22.



[20] Does the BAR CODE READER correctly identify slides now?



The procedure
is completed.



Advance to
step 21.

[21] Install a new CONTROLLER BOARD. The procedure is completed.

[22] Install a new BAR CODE READER BOARD.

[23] Do the following adjustment:

Adjustment
BAR CODE READER - Voltage

[24] Does the BAR CODE READER BOARD identify slides correctly now?



The procedure
is completed.

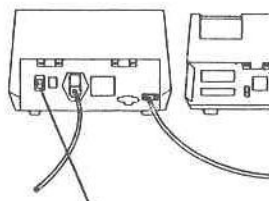


Advance to
step 25.

[25] Install a new ANALOG BOARD.

Checkout Procedure for Flash System

- [1] If access to options is possible, execute option 51 to obtain a printout of the flash count. You will use this in step 18.
- [2] To check that the FLASH LAMP operates, move the MAIN POWER SWITCH down and up and check for flashes.
- [3] Does the FLASH LAMP operate?



- [3] Does the FLASH LAMP operate?

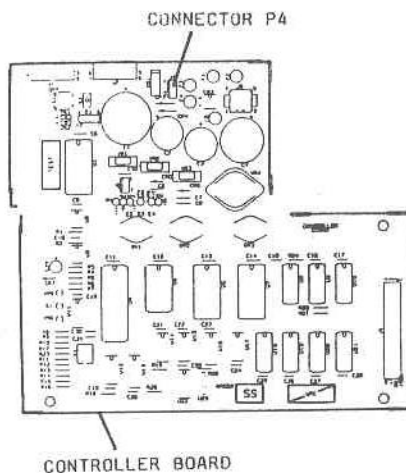


Advance to
step 18.



Advance to
step 4.

- [4] Seat CONNECTOR P4 on
CONNECTOR J4 of the
CONTROLLER BOARD.



- [5] Check again if the FLASH LAMP operates.



The procedure is completed. Advance to step 6.



Advance to
step 6.

- [6] Disconnect CONNECTOR P4 and use the MULTIMETER TL-3424 to check:

MULTIMETER TL-3424			
Location	+	Ground	Voltage
CONTROLLER BOARD	J4, PIN 1	TP4 or E3	+ 5 V dc
CONTROLLER BOARD	J4, PIN 2	TP4 or E3	+ 5 V dc
CONTROLLER BOARD	J4, PIN 3	TP4 or E3	+ 5 V dc

- [7] Are all 3 voltage readings correct?



Advance to
step 12.



Advance to
step 8.

[8] Check the continuity of the FUSES on the CONTROLLER BOARD:

- Check FUSE F1 if the voltage for J4, PIN 1 is not correct
- Check FUSE F4 if the voltage for J4, PIN 2 is not correct
- Check FUSE F3 if the voltage for J4, PIN 3 is not correct

[9] Is the continuity of the FUSES correct?



Advance to step 11.



Advance to step 10.

[10] Install new FUSES. The procedure is completed.

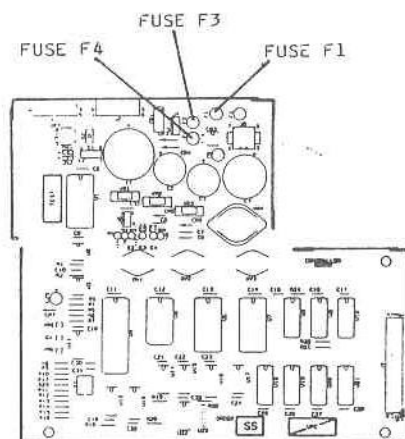
[11] Install a new CONTROLLER BOARD. The procedure is completed.

[12] Remove the FLASH ASSEMBLY. See Section 10, Parts/Removals.

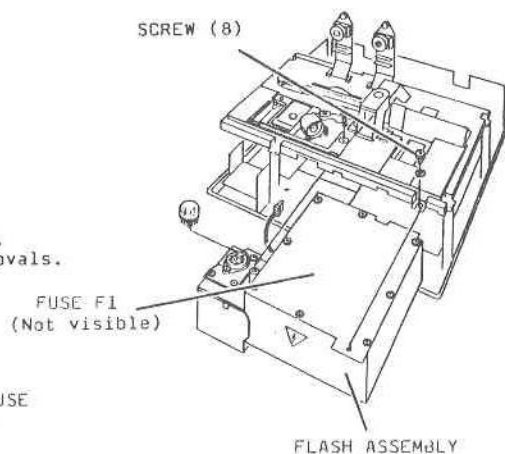
[13] Remove:

- 8 SCREWS
- COVER PLATE

[14] Check the continuity of FUSE F1 in the FLASH ASSEMBLY.



SCREW (8)



FLASH ASSEMBLY

[15] Is the continuity of FUSE F1 correct?



Advance to step 16.



Advance to step 17.

[16] Install a new FUSE F1 337355. The procedure is completed.

[17] Is the FLASH LAMP excessively brown?



Advance to step 18.



Advance to step 20.

[18] Do the following procedure to determine the necessary replacement parts:

- Check the printout of option 51 if you could obtain one in step 1.
- If the flash count is less than 2500 K, or if the FLASH ASSEMBLY is less than 4 years old, install a new FLASH LAMP 337379.
- If the flash count is more than 2500 K, or if the FLASH ASSEMBLY is more than 4 years old, install a new FLASH ASSEMBLY 3515/1 and a new FLASH LAMP 337379.

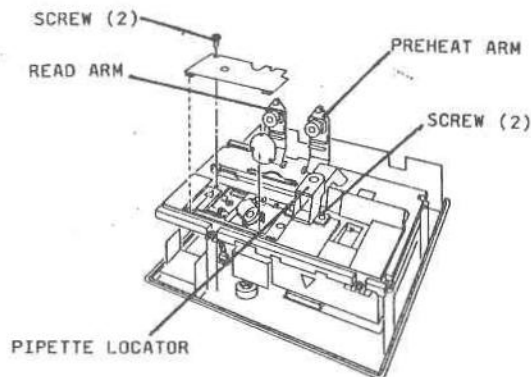
[19] Do the Correction Factors Procedure after installing a new FLASH LAMP or FLASH ASSEMBLY. The procedure is completed.

[20] The Flash System operates correctly. See the diagnostics for other possible causes of the malfunction.

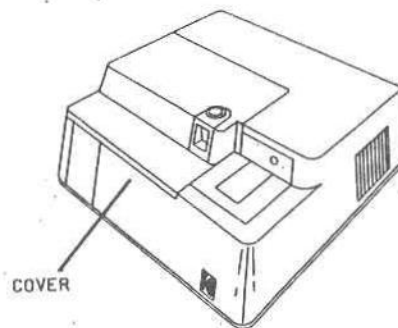
Checkout Procedure for Temperature Too Low

[1] Do the following procedure to check that the READ ARM or PREHEAT ARM are in the correct position:

- Check that the 2 SCREWS are holding the COVER PLATE fully down.
- Check that the SCREWS holding the PIPETTE LOCATOR are tight.



[2] Remove the COVER.

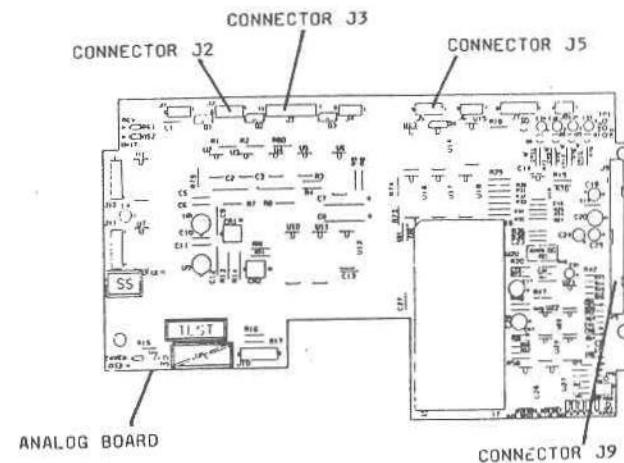


The following steps are a complete checkout of the signals and voltages for all HEATERS and THERMISTORS. It is necessary to check only the components related to the error code or error condition you are diagnosing.

[3] Seat the following CONNECTORS on the ANALOG BOARD:

- CONNECTOR J2, for the READ ARM HEATER AND THERMISTOR
- CONNECTOR J3, for the PREHEAT PLATEN ASSEMBLY
- CONNECTOR J5 is for the PREHEAT ARM AND HEATER ASSEMBLY
- CONNECTOR J9, for the RIBBON CABLE ASSEMBLY to the CONTROLLER BOARD.

[4] Wait 5 minutes. If the equipment does not reach operating temperature, continue with step 5.



[5] Do the following procedure to check that the HEATERS operate correctly:

- Remove the CONNECTOR.
- Use MULTIMETER TL-3424 and check the impedance at the following PINS:

For CONNECTOR P2, HEATER in READ ARM:

MULTIMETER TL-3424		
Location	Connection	Impedence
READ ARM	P2 - SOCKETS	less than
	1 and 2	100 ohms

For CONNECTOR P5, HEATER in PREHEAT ARM:

MULTIMETER TL-3424		
Location	Connection	Impedence
PREHEAT ARM	P5 - SOCKETS	less than
	1 and 2	100 ohms

For CONNECTOR P3, HEATER in READ PLATEN:

MULTIMETER TL-3424		
Location	Connection	Impedence
READ PLATEN	P5 - SOCKETS	less than
	1 and 2	100 ohms

For CONNECTOR P3, HEATER in PREHEAT PLATEN:

MULTIMETER TL-3424		
BOARD	Connection	Impedence
PREHEAT PLATEN	P5 - SOCKETS	less than
	9 and 10	100 ohms

[6] Is the impedance for the CONNECTORS within the limit?

Yes	No
Advance to step 8.	Advance to step 9.

[7] Install a new part:

- READ ARM 352576, if READ ARM HEATER has a malfunction
- PREHEAT ARM 351578, if PREHEAT ARM HEATER has a malfunction
- PREHEAT PLATEN ASSEMBLY 351566, if the PLATEN HEATERS have a malfunction.

[8] Energize the DTSC MODULE and wait 5 minutes. If the equipment does not reach operating temperature, advance to step 9.

[9] Do the following procedure to check that the CONTROL THERMISTORS operate correctly:

- Remove the CONNECTOR.
- Use MULTIMETER TL-3424 and check the impedance at the PINS.

NOTE

An impedance of approximately 0 K ohms indicates a short-circuit.
An impedance measurement at maximum indicates a break in the circuit.

For CONNECTOR P2, THERMISTOR in READ ARM:

MULTIMETER TL-3424		
Location	Connection	Impedence
READ ARM	P2 - SOCKETS	10 K ohms warm, 6.2 K ohms cold

For CONNECTOR P5, THERMISTOR in PREHEAT ARM:

MULTIMETER TL-3424		
Location	Connection	Impedance
PREHEAT ARM	P5 - SOCKETS 4 and 5	10 K ohms warm, 6.2 K ohms cold

For CONNECTOR P3, THERMISTOR in READ PLATEN:

MULTIMETER TL-3424		
Location	Connection	Impedance
READ PLATEN	P3 - SOCKETS 4 and 3	10 K ohms warm, 6.2 K ohms cold

For CONNECTOR P3, THERMISTOR in PREHEAT PLATEN:

MULTIMETER TL-3424		
Location	Connection	Impedance
PREHEAT PLATEN	P3 - PINS 7 and 8	10 K ohms warm, 6.2 K ohms cold

[10] Is the impedance for the THERMISTORS within the limit?



Advance to
step 13.



Advance to
step 11.

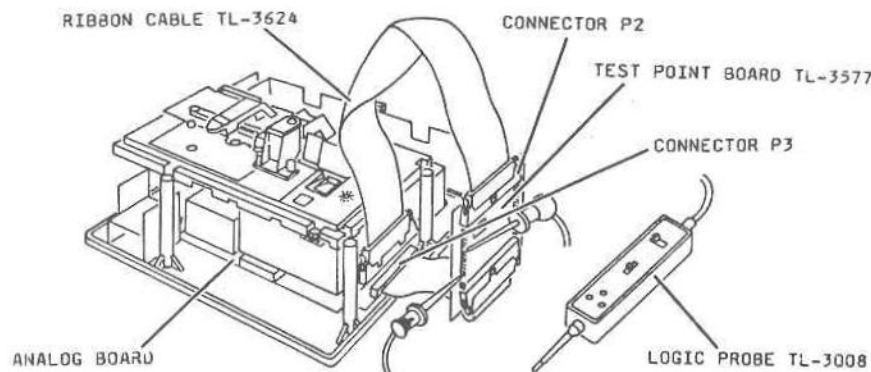
[11] Install a new part:

- READ ARM 352576, if READ ARM THERMISTOR has a malfunction
- PREHEAT ARM 351578, if PREHEAT ARM THERMISTOR has a malfunction
- PREHEAT PLATEN ASSEMBLY 351566, if the PLATEN THERMISTORS have a malfunction.

[12] Energize the DTSC MODULE and wait 5 minutes. If the equipment does not reach operating temperature, advance to step 13.

[13] Do the following procedure to check that the signals from the CONTROLLER BOARD are correct:

- Connect the RIBBON CABLE TL-3624 to the TEST POINT BOARD TL-3577. Bend the RIBBON CABLE. See the figure.
- Connect the other end of the RIBBON CABLE to CONNECTOR P3 from the CONTROLLER BOARD.
- To obtain power for the LOGIC PROBE TL-3008, connect it to the TEST POINT BOARD TL-3577:
 - Connect the black wire to PIN 15 for ground
 - Connect the other wire to PIN 17 for power



- Use the LOGIC PROBE TL-3008 to check the signals:

For PREHEAT ARM HEATER:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PIN 10	Pulse

For READ ARM HEATER:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PIN 11	Pulse

For READ PLATEN HEATER:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PIN 9	Pulse

For PREHEAT PLATEN HEATER:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PIN 12	Pulse

[14] Are the signals pulsing?



Advance to step 15.



Advance to step 18.

[15] Do the following procedure to check the +14 V dc power supply to the HEATERS and THERMISTORS:

- Connect the RIBBON CABLE TL-3624 and the TEST POINT BOARD TL-3577, as described in step 13.

- Use MULTIMETER TL-3424 to check:

MULTIMETER TL-3424			
Location	+	Ground	Voltage
TL-3577	PIN 7 or 8	PIN 5 or 6	+14 V dc

[16] Is the voltage correct?



Advance to step 17.



Advance to step 18.

[17] Install a new ANALOG BOARD.

[18] Install a new CONTROLLER BOARD.

Checkout Procedure for Temperature Too High

[1] Does the FAN operate?



Advance to
step 6.



Advance to
step 2.

[2] Seat CONNECTOR P6. If the FAN does not now operate, advance to step 3.

[3] Disconnect CONNECTOR J6 and use the MULTIMETER TL-3424 to check:

MULTIMETER TL-3424		
BOARD	Connection	Voltage
CONTROLLER	J6 - PINS 1 and 2	+12 V dc

[4] Is the voltage correct?

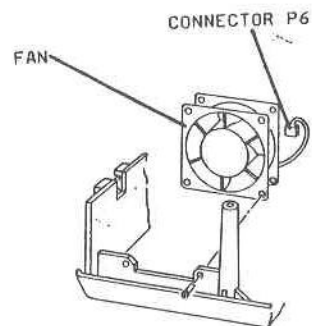


Advance to
step 11.



Advance to
step 5.

[5] Install a new FAN ASSEMBLY 351491.



[6] Seat CONNECTOR P5 on the CONTROLLER BOARD.

[7] Check FUSES F3 and F4 on the CONTROLLER BOARD for continuity.

[8] Do FUSES operate correctly?



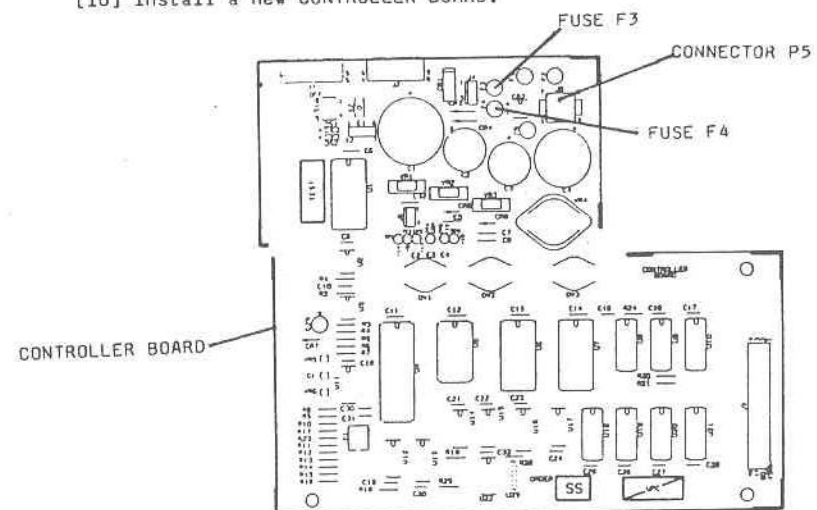
Advance to
step 10.



Advance to
step 9.

[9] Install new FUSES.

[10] Install a new CONTROLLER BOARD.

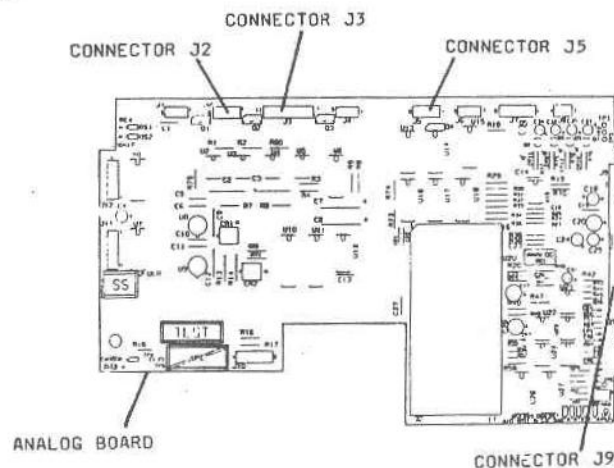


The following steps are a complete checkout of the signals and voltages for all HEATERS and THERMISTORS. It is necessary to check only the components related to the error code or error condition you are diagnosing.

[11] Seat the following CONNECTORS on the ANALOG BOARD:

- CONNECTOR J2, for the READ ARM HEATER AND THERMISTOR
- CONNECTOR J3, for the PREHEAT PLATEN ASSEMBLY
- CONNECTOR J5 is for the PREHEAT ARM AND HEATER ASSEMBLY
- CONNECTOR J9, for the RIBBON CABLE ASSEMBLY to the CONTROLLER BOARD.

[12] Wait 5 minutes. If temperature is not correct, advance to step 13.



[13] Do the following procedure to check that the HEATERS operate correctly:

- Remove the CONNECTOR.
- Use MULTIMETER TL-3424 and check the impedance at the following PINS:

For CONNECTOR P2, HEATER in READ ARM:

MULTIMETER TL-3424		
Location	Connection	Impedence
READ ARM	P2 - SOCKETS	less than
	1 and 2	100 ohms

For CONNECTOR P5, HEATER in PREHEAT ARM:

MULTIMETER TL-3424		
Location	Connection	Impedence
PREHEAT ARM	P5 - SOCKETS	less than
	1 and 2	100 ohms

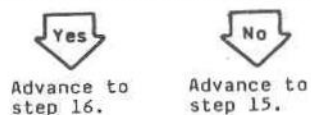
For CONNECTOR P3, HEATER in READ PLATEN:

MULTIMETER TL-3424		
Location	Connection	Impedence
READ PLATEN	P3 - SOCKETS	less than
	1 and 2	100 ohms

For CONNECTOR P3, HEATER in PREHEAT PLATEN:

MULTIMETER TL-3424		
BOARD	Connection	Impedence
PREHEAT PLATEN	P3 - SOCKETS	less than
	9 and 10	100 ohms

[14] Is the impedance for the CONNECTORS within the limit?



[15] Install a new part:

- READ ARM 352576, if READ ARM HEATER has a malfunction
- PREHEAT ARM 351578, if PREHEAT ARM HEATER has a malfunction
- PREHEAT PLATEN ASSEMBLY 351566, if the PLATEN HEATERS have a malfunction.

[16] Do the following procedure to check that the CONTROL THERMISTORS operate correctly:

- Remove the CONNECTOR.
- Use MULTIMETER TL-3424 and check the impedance at the PINS.

NOTE

An impedance of approximately 0 K ohms indicates a short circuit.
An impedance measurement at maximum indicates a break in the circuit.

For CONNECTOR P2, THERMISTOR in READ ARM:

MULTIMETER TL-3424		
Location	Connection	Impedance
READ ARM	P2 - SOCKETS	10 K ohms warm, 4 and 5 6.2 K ohms cold

For CONNECTOR P5, THERMISTOR in PREHEAT ARM:

MULTIMETER TL-3424		
Location	Connection	Impedance
PREHEAT ARM	P5 - SOCKETS	10 K ohms warm, 4 and 5 6.2 K ohms cold

For CONNECTOR P3, THERMISTOR in READ PLATEN:

MULTIMETER TL-3424		
Location	Connection	Impedance
READ PLATEN	P3 - SOCKETS	10 K ohms warm, 4 and 3 6.2 K ohms cold

For CONNECTOR P3, THERMISTOR in PREHEAT PLATEN:

MULTIMETER TL-3424		
Location	Connection	Impedance
PREHEAT PLATEN	P3 - PINS	10 K ohms warm, 7 and 8 6.2 K ohms cold

[17] Is the impedance for the THERMISTORS within the limit?



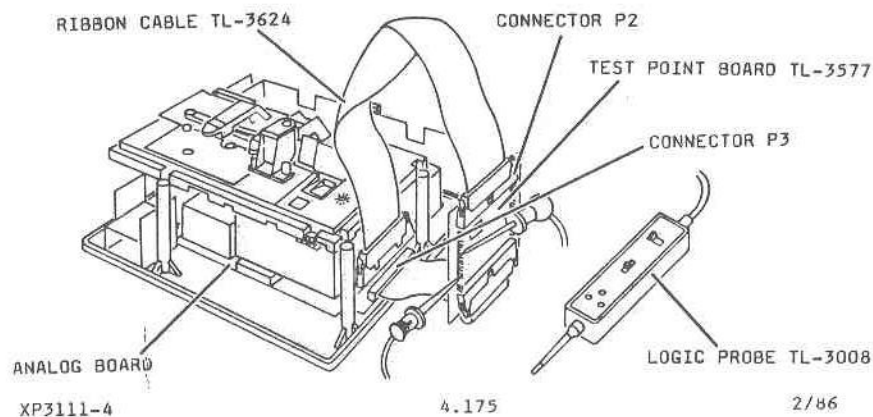
[18] Install a new part:

- READ ARM 352576, if READ ARM THERMISTOR has a malfunction
- PREHEAT ARM 351578, if PREHEAT ARM THERMISTOR has a malfunction
- PREHEAT PLATEN ASSEMBLY 351566, if the PLATEN THERMISTORS have a malfunction.

[19] Energize the DTSC MODULE and wait 5 minutes. If the equipment does not reach operating temperature, advance to step 13.

[20] Do the following procedure to check that the signals from the CONTROLLER BOARD are correct:

- Connect the RIBBON CABLE TL-3624 to the TEST POINT BOARD TL-3577. Bend the RIBBON CABLE. See the figure.
- Connect the other end of the RIBBON CABLE to CONNECTOR P3 from the CONTROLLER BOARD.
- To obtain power for the LOGIC PROBE TL-3008, connect it to the TEST POINT BOARD TL-3577:
 - Connect the black wire to PIN 15 for ground
 - Connect the other wire to PIN 17 for power



- Use the LOGIC PROBE TL-3008 to check the signals:

NOTE

If the drive signal does not pulse but is energized continually, a malfunction is indicated.

For PREHEAT ARM HEATER:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PIN 10	Pulse

For READ ARM HEATER:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PIN 11	Pulse

For READ PLATEN HEATER:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PIN 9	Pulse

For PREHEAT PLATEN HEATER:

TL-3577, TL-3578, TL-3008		
Location	Connection	Signal
TL-3577	PIN 12	Pulse

[21] Are the signals pulsing?



Advance to
step 22.



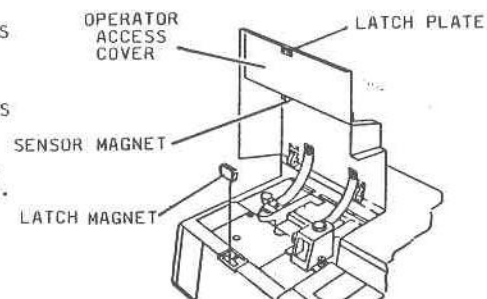
Advance to
step 23.

[22] Install a new CONTROLLER BOARD.

[23] Install a new ANALOG BOARD.

Checkout Procedure for HALL EFFECT SENSOR "COVER OPEN"

- [1] Check that the OPERATOR ACCESS COVER closes and seats correctly.
- [2] Check that the OPERATOR ACCESS COVER has a LATCH PLATE.
- [3] Check that the LATCH PLATE is aligned with the LATCH MAGNET.
- [4] Check that the SENSOR MAGNET is installed. Install a new OPERATOR ACCESS COVER if necessary.
- [5] Check that CONNECTOR P10 for the HALL EFFECT BOARD is seated on the ANALOG BOARD.
- [6] Check that the 2 SCREWS that hold the COVER are tight.



- [7] Remove the DISPOSAL CUP to make LED DS3 on the ANALOG BOARD visible.

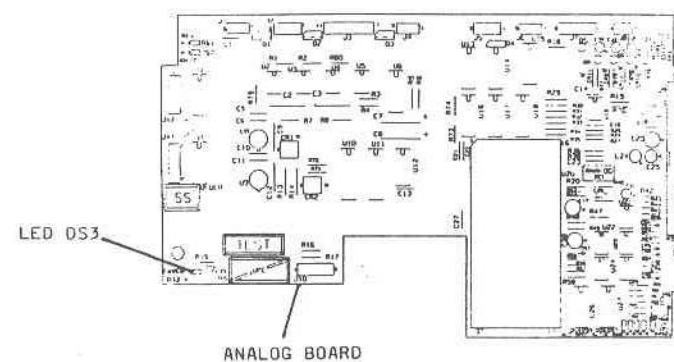
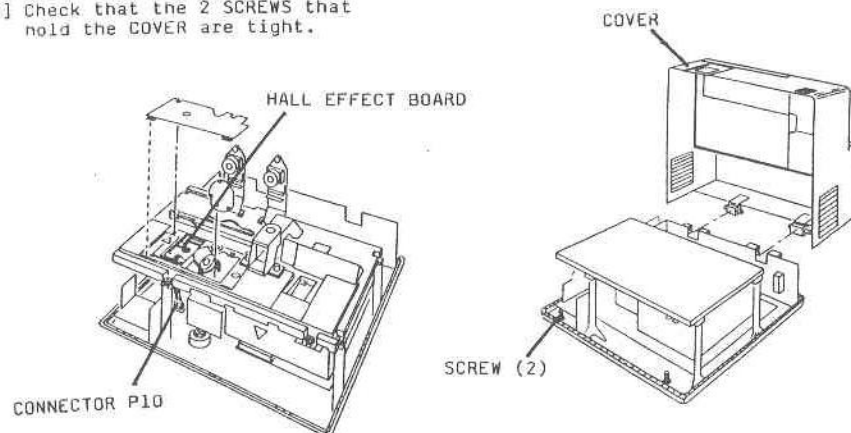
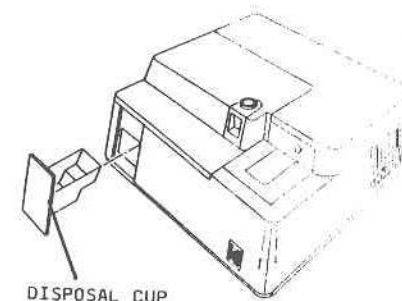
- [8] Check that LED DS3 on the ANALOG BOARD energizes when the OPERATOR ACCESS COVER is down.



The procedure is completed.



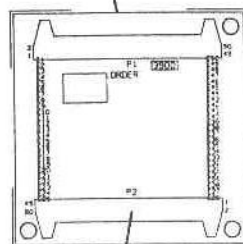
Advance to step 9.



[9] Do the following procedure to check the signals from the HALL EFFECT BOARD:

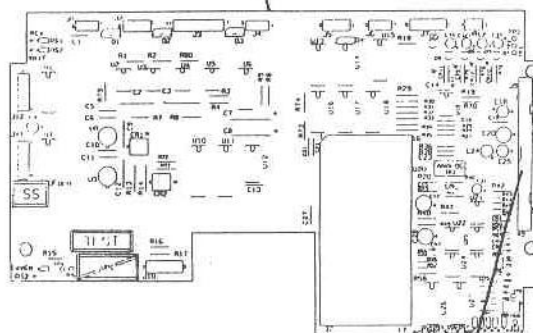
- Remove the COVER.
- Connect the RIBBON CABLE TL-3624 to CONNECTOR P2 on the TEST POINT BOARD TL-3577.
- Connect the other end of the RIBBON CABLE to CONNECTOR J9 on the ANALOG BOARD.

TEST POINT BOARD TL-3577



CONNECTOR P2

ANALOG BOARD



CONNECTOR J9

- Use the MULTIMETER TL-3424 to check the voltage:

- Place the south pole of a strong magnet over the HALL EFFECT SENSOR for the COVER and check:

YL-3424, TL-3577, TL-3624			
Location	+	Ground	Voltage
TL-3577	TP43	TP15	2.5 + .1 V dc

- Remove the magnet and check:

YL-3424, TL-3577, TL-3624			
Location	+	Ground	Voltage
TL-3577	TP43	TP15	.8 + .1 V dc

[10] Are the voltages correct?



Advance to step 11.



Advance to step 12.

[11] Install a new CONTROLLER BOARD.

[12] Use the MULTIMETER TL-3424 to check the voltage:

- Remove CONNECTOR P10 from the ANALOG BOARD.
- Place the south pole of a strong magnet over the HALL EFFECT SENSOR for the COVER and check:

TL-3424, TL-3577, TL-3624			
Location	+	Ground	Voltage
HALL EFFECT BOARD	P10, SOCKET 2	TP15 on TL-3577	2.5 + .1 V dc

- Remove the magnet and check:

TL-3424, TL-3577, TL-3624			
Location	+	Ground	Voltage
HALL EFFECT BOARD	P10, SOCKET 2	TP15 on TL-3577	.8 + .1 V dc

[13] Are the voltages correct?



Advance to step 14.



Advance to step 15.

[14] Install a new ANALOG BOARD.

[15] Install a new HALL EFFECT BOARD.

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Customer Equipment Services Division
EASTMAN KODAK COMPANY • ROCHESTER, N.Y. 14650



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Supersedes XP3111-5, 3/86

Kodak Ektachem DTSC MODULE Diagrams Section 5

PLEASE NOTE

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• CAUTION •



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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"PIGGY BACK" BOARD	10

Figure 1 ANALOG BOARD - System Interconnect, Version 1

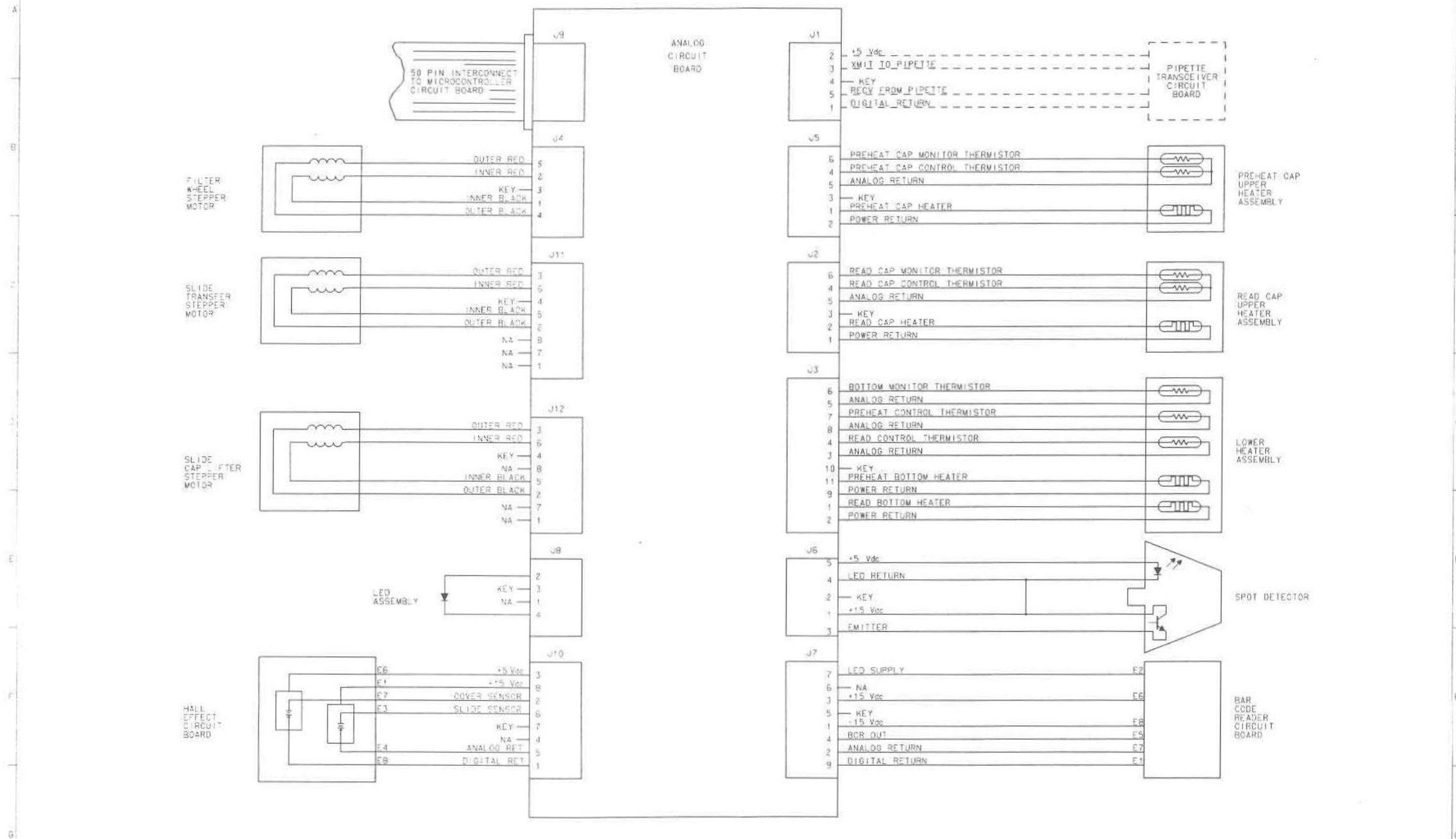
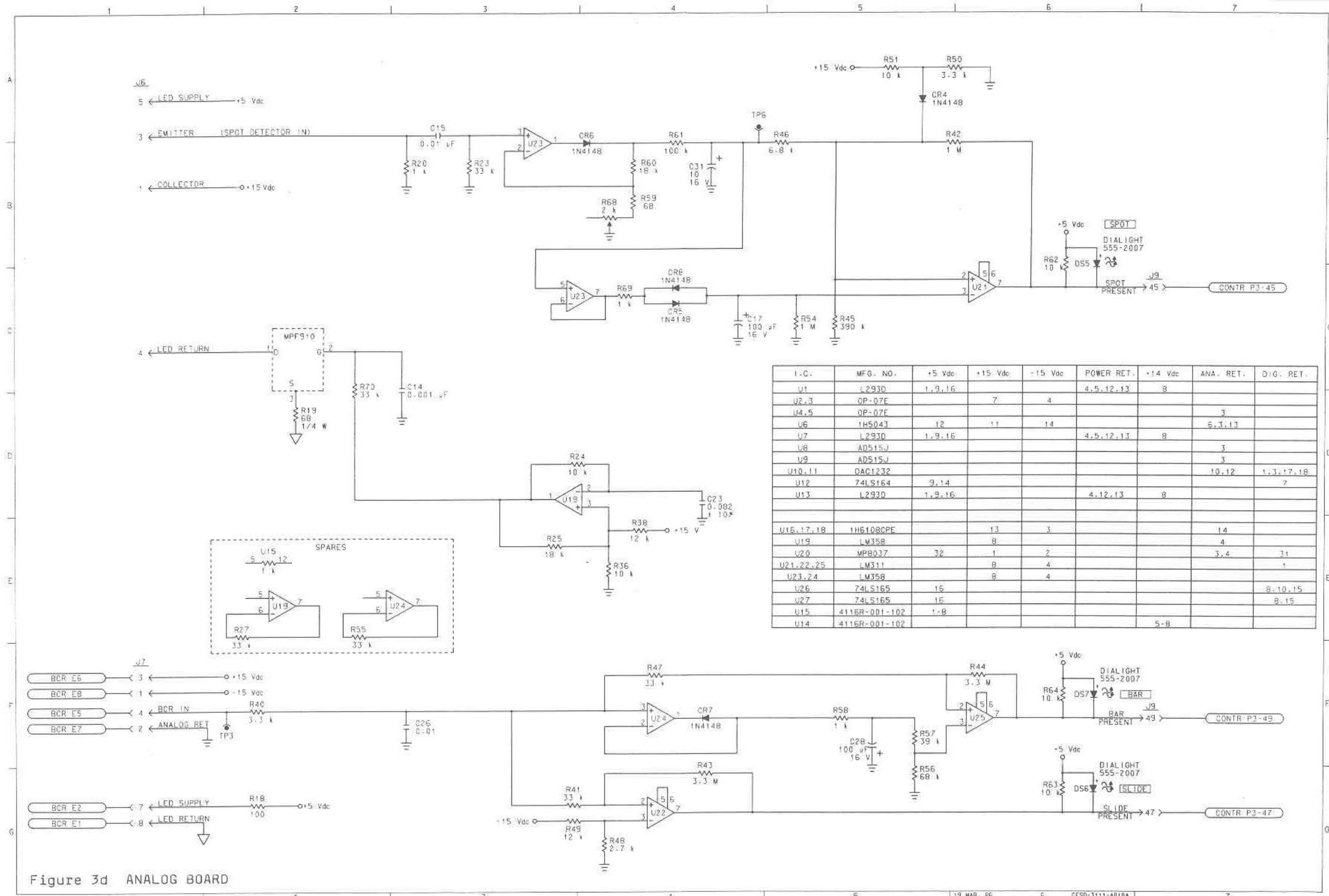


Figure 2 ANALOG BOARD - System Interconnect, Version 2







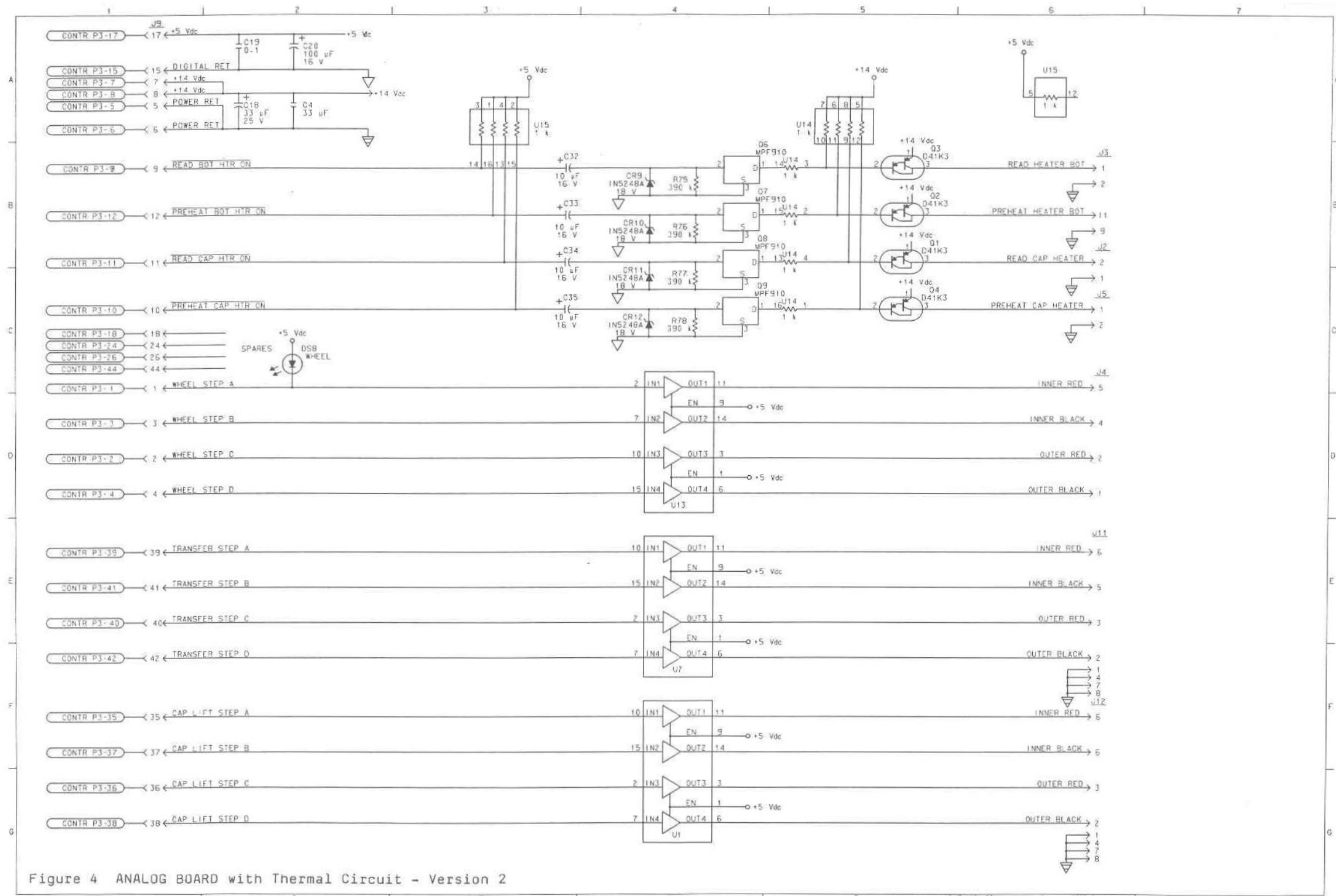


Figure 4 ANALOG BOARD with Thermal Circuit - Version 2

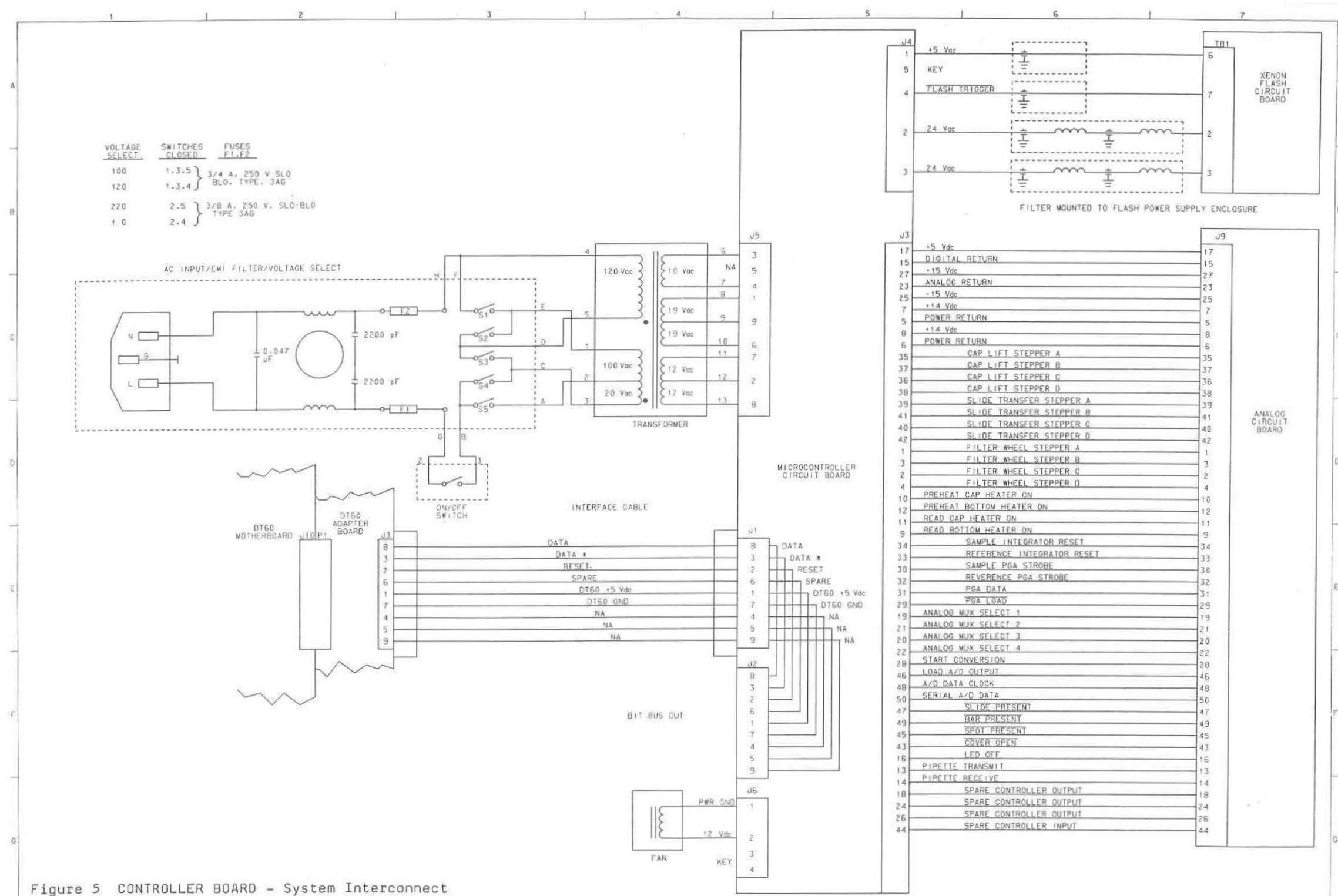


Figure 6a CONTROLLER BOARD

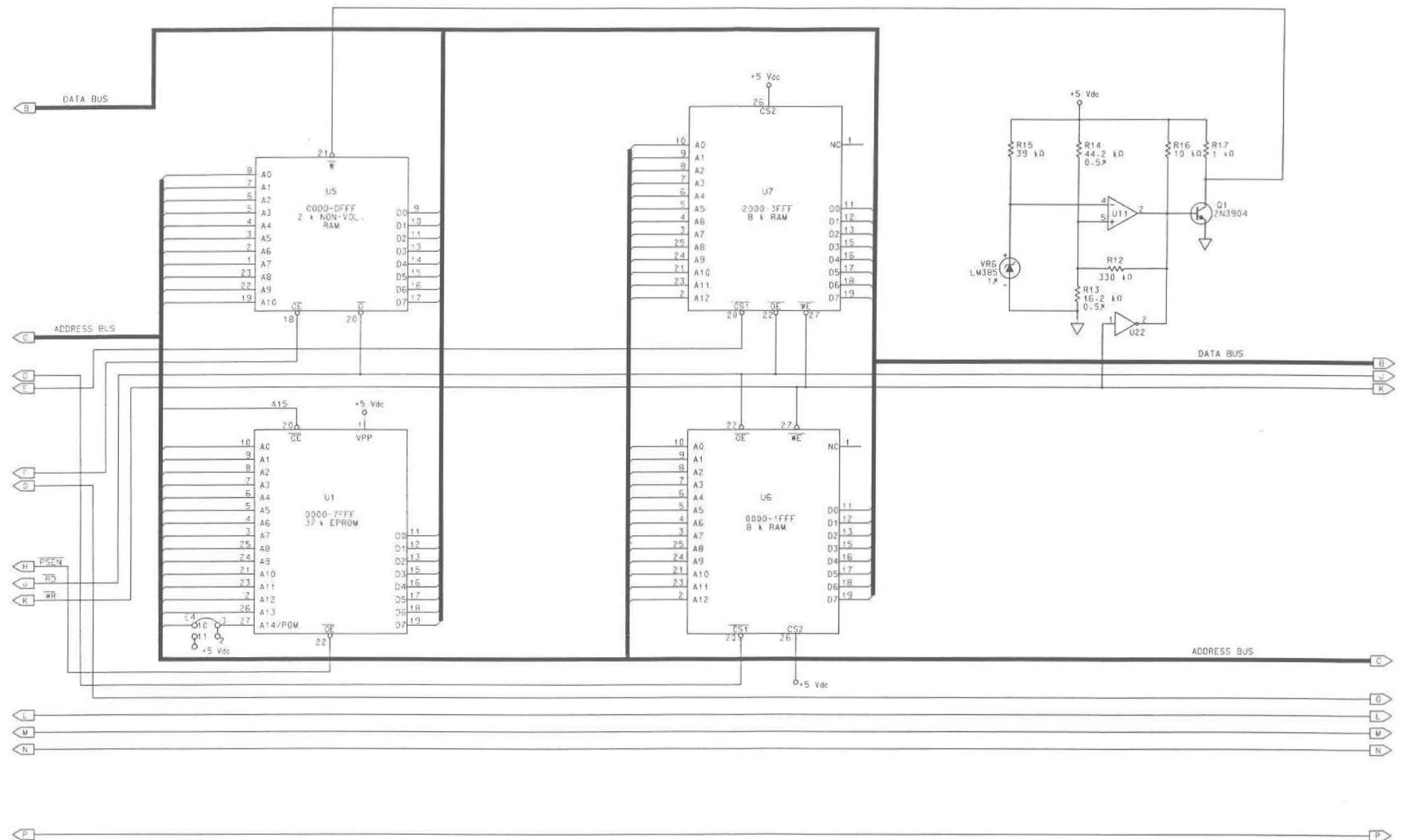
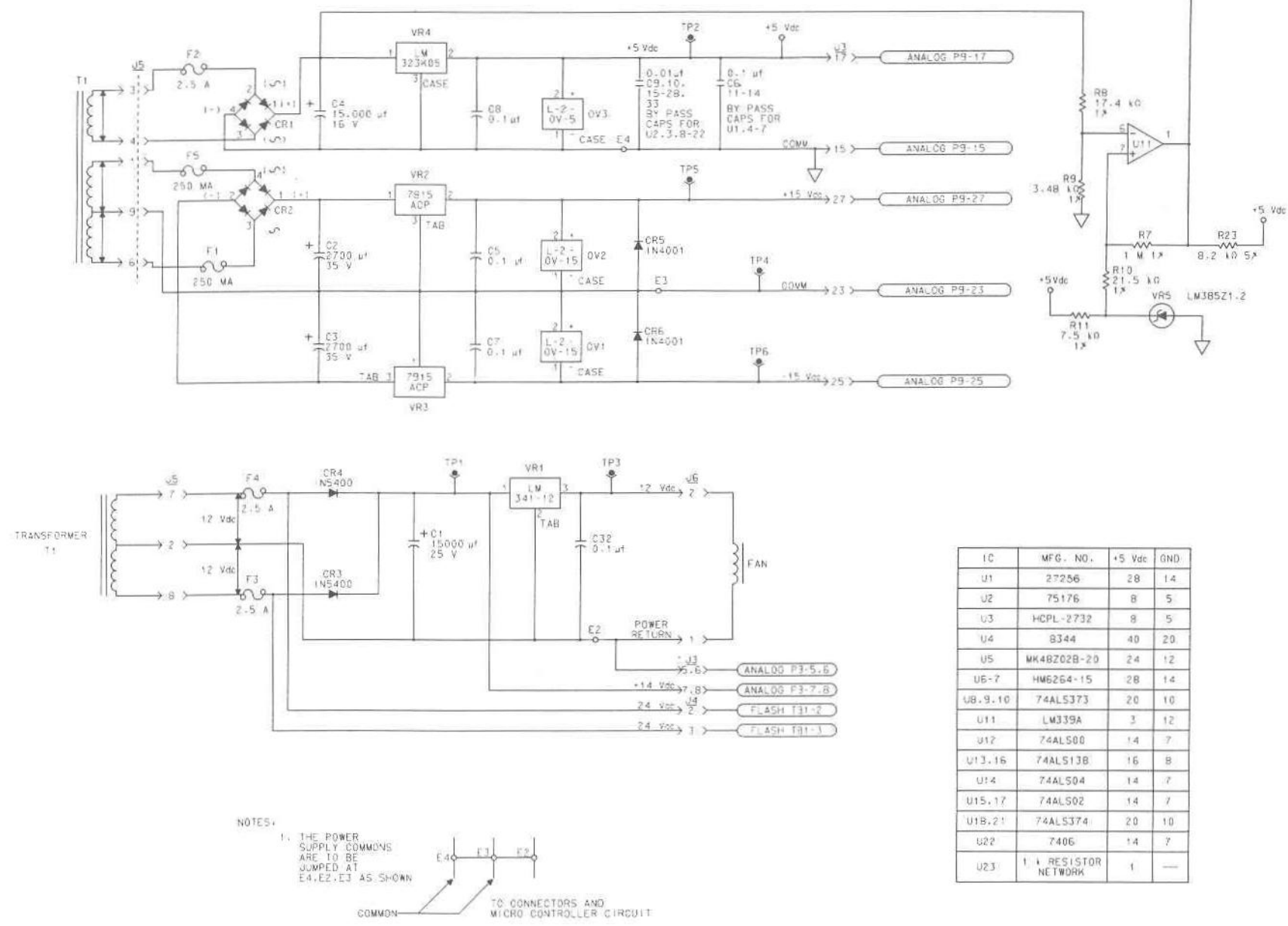


Figure 6b CONTROLLER BOARD

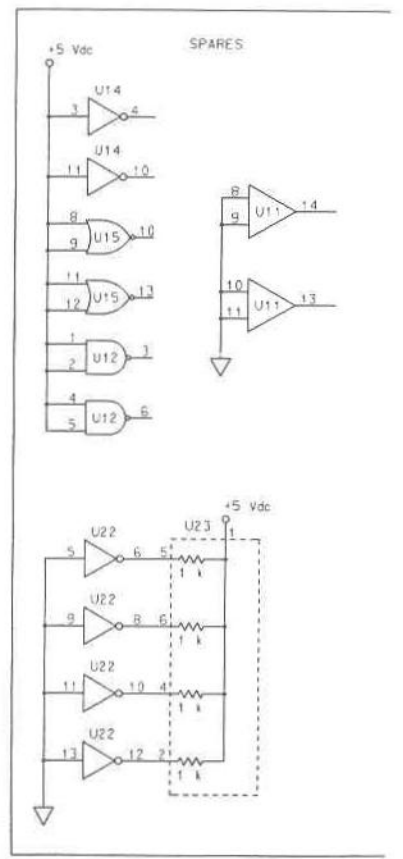
(Sheet 2 of 4)

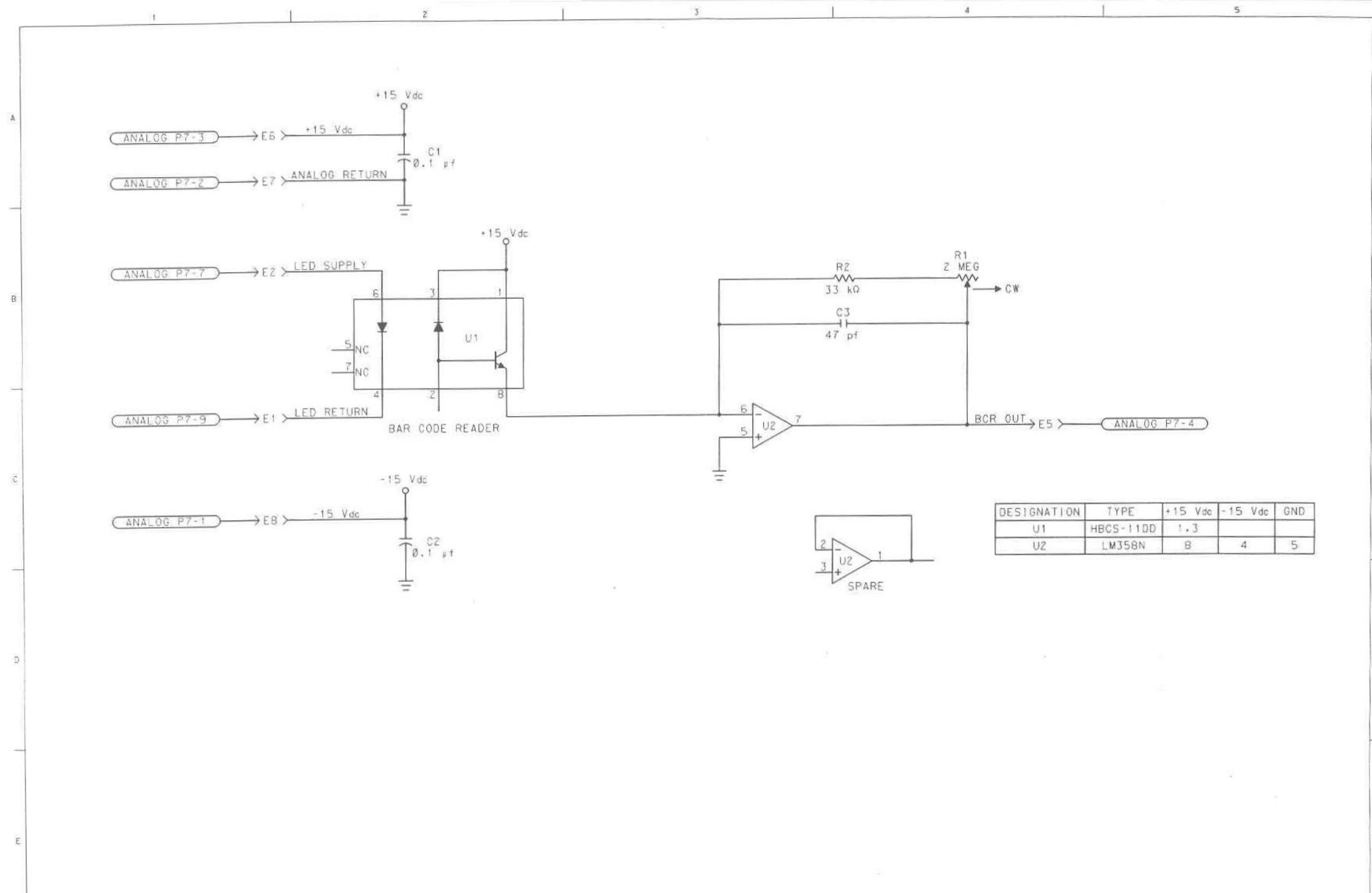


NOTES:
 1. THE POWER SUPPLY COMMONS ARE TO BE JUMPED AT E4, E2, E3 AS SHOWN

COMMON TO CONNECTORS AND MICRO CONTROLLER CIRCUIT

IC	MFG. NO.	+5 Vdc	GND
U1	27256	28	14
U2	75176	8	5
U3	HCPL-2732	8	5
U4	8344	40	20
U5	MK4BZ02B-20	24	12
U6-7	HM6264-15	28	14
U8-9-10	74ALS373	20	10
U11	LM339A	3	12
U12	74ALS00	14	7
U13-16	74ALS138	16	8
U14	74ALS04	14	7
U15-17	74ALS02	14	7
U18-21	74ALS374	20	10
U22	7406	14	7
U23	1 k RESISTOR NETWORK	1	—





DESIGNATION	TYPE	+15 Vdc	-15 Vdc	GND
U1	HBCS-110D	1,3		
U2	LM358N	8	4	5

Figure 7 BAR CODE READER BOARD

A

B

C

D

E

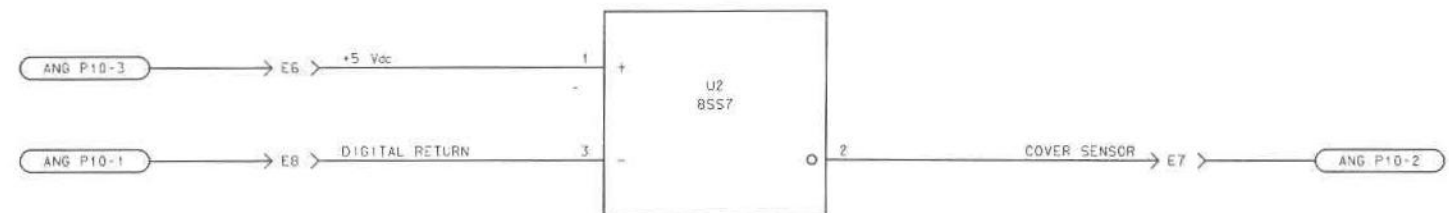
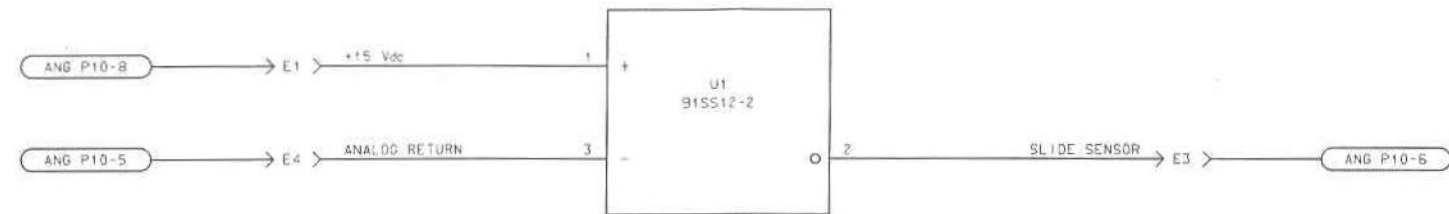


Figure 8 HALL-EFFECT SENSOR BOARD



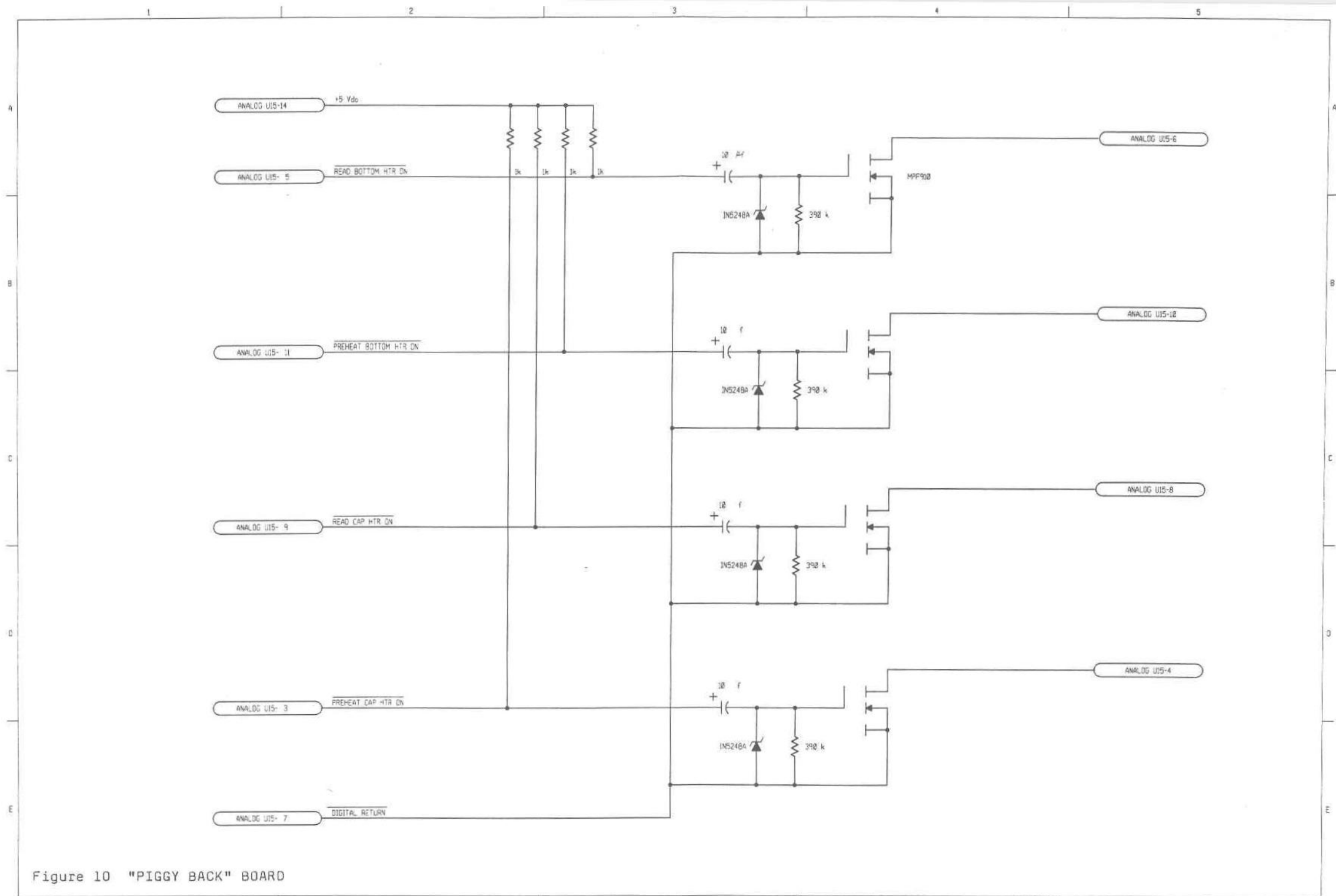


Figure 10 "PIGGY BACK" BOARD

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Kodak Ektachem DTSC MODULE Section 6 Adjustments

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• CAUTION •



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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Kodak Ektachem DTSC MODULE

Adjustments

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FILTER WHEEL	6.31

SLIDE TRANSPORT BELT — Tension

Purpose: To obtain the correct tension for the SLIDE TRANSPORT BELT. If the tension is not correct, the SLIDE TRANSPORT CLIP will not engage the slides correctly. If the SLIDE TRANSPORT BELT is too tight, damage could occur to the SLIDE TRANSPORT MOTOR, the SLIDE TRANSPORT BELT, or the PULLEYS. If the SLIDE TRANSPORT BELT is too loose, the PULLEYS will not engage the SLIDE TRANSPORT BELT correctly, and slide transport errors could result.

Description: To obtain the correct adjustment you must:

- Use a special tool to measure the tension.
- Adjust the tension.

When to Do: - After installing the SLIDE TRANSPORT BELT
- During the Checkout Procedure for the Slide Transport System

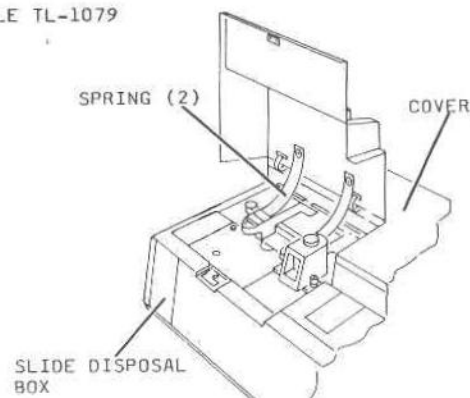
Specifications: The SLIDE TRANSPORT BELT must compress with 4.5 to 5.5 ounces of force.

Special Tools: PUSH-PULL SCALE TL-1079

To Check:

[1] Remove:

- 2 SPRINGS
- SLIDE DISPOSAL BOX
- COVER



Adjustment for SLIDE TRANSPORT BELT - Tension

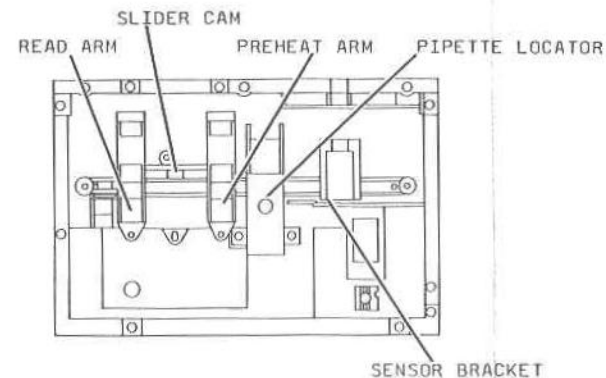
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[2] Remove:

- SENSOR BRACKET
- PIPETTE LOCATOR
- SLIDER CAM
- READ ARM
- PREHEAT ARM



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[3] Rotate the IDLER PULLEY to move the SLIDE TRANSPORT CLIP to the Pickup Station.

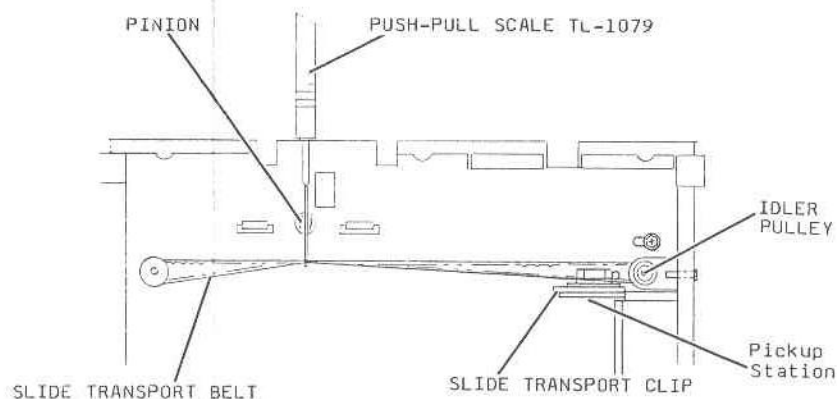
[4] Place the end of the PUSH-PULL SCALE TL-1079 on the front side of the SLIDE TRANSPORT BELT, at the point adjacent to the PINION for the SLIDER CAM.

[5] Pull the front side of the SLIDE TRANSPORT BELT until it makes contact with the rear side.

[6] Is the force 4.5 to 5.5 ounces?

Yes
Advance to
step 11.

No
Advance to
step 7.



Adjustment for SLIDE TRANSPORT BELT - Tension

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6.5

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To Adjust:

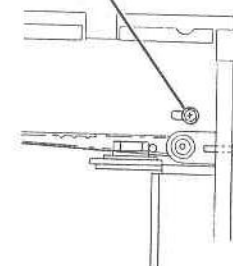
[7] Loosen the LOCKING SCREW.

[8] Use the PUSH-PULL SCALE TL-1079 to compress the SLIDE TRANSPORT BELT.

[9] At the same time rotate the ADJUSTMENT SCREW to obtain the correct tension.

	increases the tension
	decreases the tension

LOCKING SCREW



ADJUSTMENT SCREW

[10] When a tension of 4.5 to 5.5 ounces is obtained, tighten the LOCKING SCREW.

[11] Install:

- READ ARM
- PREHEAT ARM
- SENSOR BRACKET
- PIPETTE LOCATOR
- SLIDER CAM
- COVER
- SLIDE DISPOSAL BOX
- 2 SPRINGS

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SPOT DETECTOR SENSOR – Illumination

Purpose: The SPOT DETECTOR SENSOR is a Light Emitting Diode that monitors the reflectance of slides in the Spotting Station. The SPOT DETECTOR SENSOR must be adjusted to be able to detect the difference between 3 possible slide conditions:

- If no slide, low reflectance.
- If slide without drop, high reflectance.
- If slide with drop, reduced reflectance.

If the light projected by the SPOT DETECTOR SENSOR is too low, the SENSOR will not be able to detect the reduction in reflectance. If the illumination is too high, the SENSOR will not be stable.

Description: To obtain the correct adjustment, you must:

- Measure the reflectance from a given slide.
- Adjust the illumination of the SPOT DETECTOR SENSOR to cause the voltage readings to be within the correct limits.
- Check for correct operation.

When to Do:

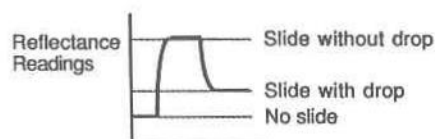
- After installing a new SPOT DETECTOR SENSOR.
- During the Checkout Procedure for SPOT DETECTOR SENSOR.
- After installing a new ANALOG BOARD.

Adjustment for the SPOT DETECTOR SENSOR - Illumination

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SPOT DETECTOR correctly adjusted



SPOT DETECTOR adjusted too high



SPOT DETECTOR adjusted too low

Specifications: 8.50 to 9.00 V dc with an NH₃ slide
8.30 to 8.80 V dc with a CK slide

Special Tools and Materials: MULTIMETER TL-3424
NH₃ slide or CK slide

Test Points: For ANALOG BOARD Configuration 1:

MULTIMETER TL-3424	
+	-
TP 6 on ANALOG BOARD	TP 4 or E3 on CONTROLLER BOARD

For ANALOG BOARD Configuration 2:

MULTIMETER TL-3424	
+	-
TP 6 on ANALOG BOARD	TP 7 on ANALOG BOARD

POTENTIOMETER: R68 on ANALOG BOARD

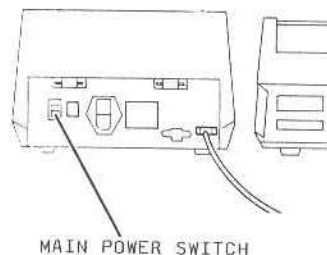
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To Check:

- [1] Move the MAIN POWER SWITCH to the "1" position.
- [2] Execute option 70 to disable the COVER monitoring functions.



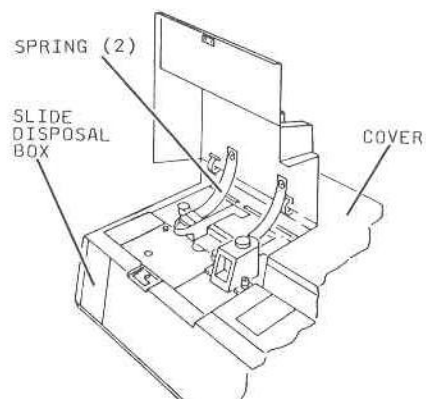
[3] Remove:

- 2 SPRINGS
- SLIDE DISPOSAL BOX
- COVER

- [4] Wait until the message "DTSC READY" is displayed.

- [5] Insert an NH₃ or CK slide.

NH₃ and CK slides have almost maximum white reflectance.

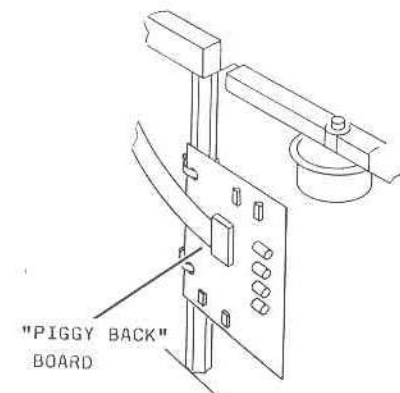


- [6] Execute option 108 to move the slide to the Spotting Station.

- [7] Is the ANALOG BOARD Configuration 1 or Configuration 2?

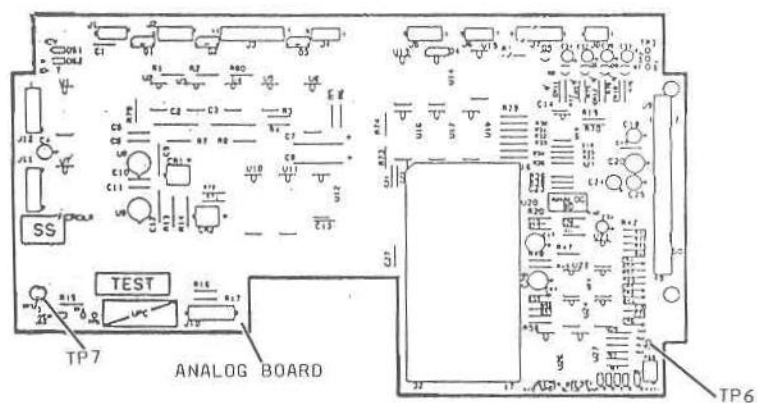
NOTE

Configuration 1 has a "PIGGY BACK" BOARD attached to the ANALOG BOARD. Configuration 2 has no "PIGGY BACK" BOARD.



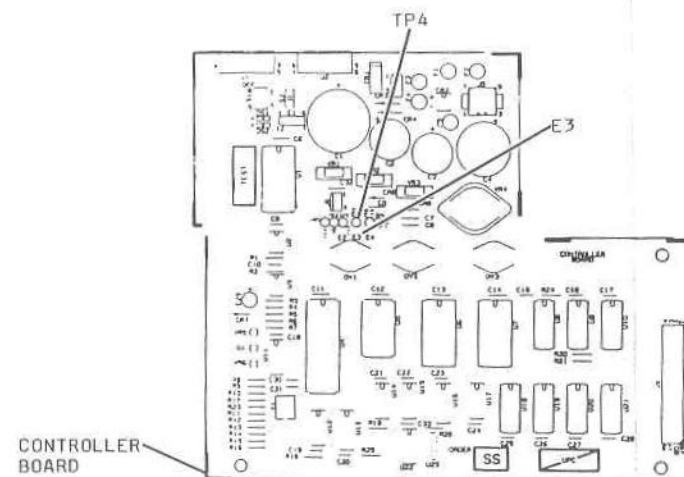
[8] Connect the MULTIMETER TL-3424 and advance to step 10.

MULTIMETER TL-3424	
+	-
TP 6 on ANALOG BOARD	TP 7 on ANALOG BOARD



[9] Connect the MULTIMETER TL-3424.

MULTIMETER TL-3424	
+	-
TP 6 on ANALOG BOARD	TP 4 or E3 on CONTROLLER BOARD



Adjustment for the SPOT DETECTOR SENSOR - Illumination

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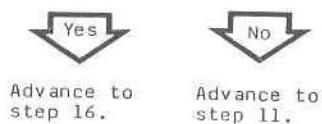
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[10] Is the voltage correct?

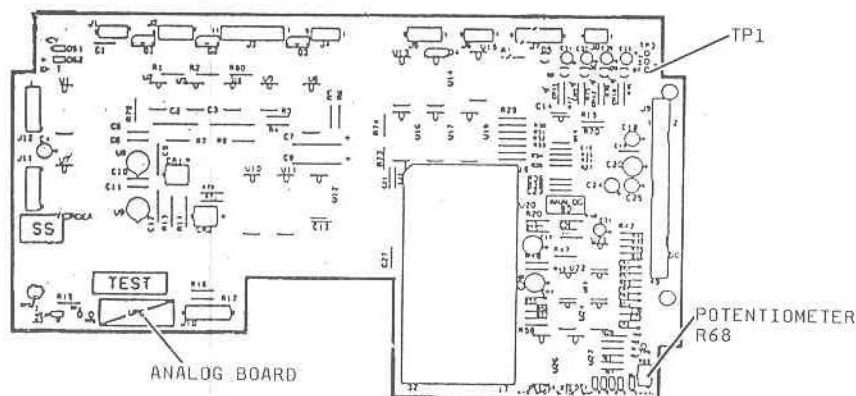
- If using an NH_3 slide, voltage should be 8.50 to 9.00 V dc
- If using a CK slide, voltage should be 8.30 to 8.80 V dc



To Adjust

[11] Rotate POTENTIOMETER R68 on the ANALOG BOARD to obtain the correct voltage reading.

[12] Press "clear" to inhibit option 108 and remove the slide from the Spotting Station.



Adjustment for the SPOT DETECTOR SENSOR - Illumination

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[13] Press the following keys to return to normal operation:

- "shift"
- "service mode"

NOTE

The DTSC MODULE will initialize.

[14] Do the following procedure to check the new adjustment:

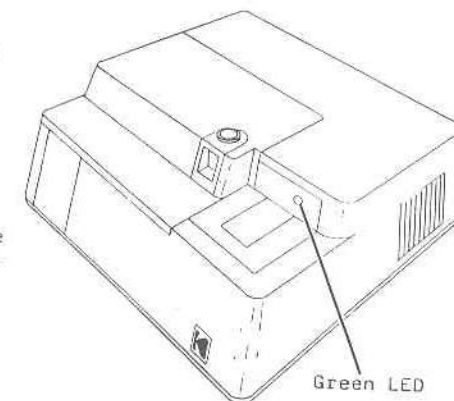
- Insert a slide for another available chemistry.
- Wait for the slide to move to the Spotting Station.
- Dispense fluid on the slide.

- Check that the drop is detected correctly by the SPOT DETECTOR SENSOR.

NOTE

The green LED will stop flashing when the drop is detected.

[15] Do step 14 again for all the other available chemistries.



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[16] Remove the slides.

[17] Install:

- COVER
- SLIDE DISPOSAL BOX
- 2 SPRINGS

[18] Move the MAIN POWER SWITCH for the ANALYZER to "0" and then "1" to enable the COVER monitoring functions.

Adjustment for the SPOT DETECTOR SENSOR - Illumination

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BAR CODE READER

Purpose: The BAR CODE READER sends a voltage signal corresponding to the white and black lines in the bar code on the slide. When the BAR CODE READER is adjusted correctly, the voltage signal has one uniform value for the white lines, and another uniform value for the black lines. If the voltage signal is not adjusted correctly, the ANALOG BOARD might not be able to detect the difference between the signals for white and black lines.

Description: To obtain the correct adjustment, you must:

- Insert a tool slide under the LED.
- Adjust the voltage for the white reading to be within specifications.

When to Do:

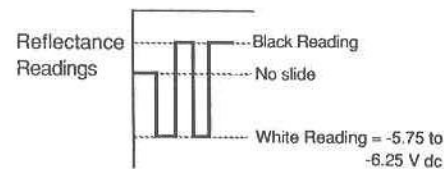
- After installing a new BAR CODE READER.
- During the Checkout Procedure for BAR CODE READER.

Adjustment for BAR CODE READER - Voltage

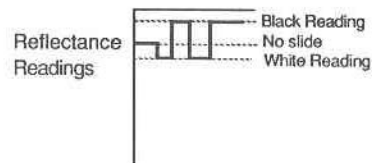
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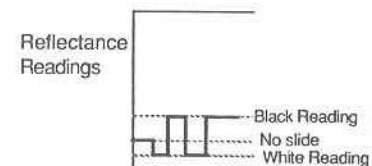
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BAR CODE READER correctly adjusted



BAR CODE READER adjusted too low



BAR CODE READER adjusted too high

Specifications: -5.75 to -6.25 V dc with BAR CODE READER SLIDE TL-3385
Less than 2.0 V dc with no slide

Special Tools: MULTIMETER TL-3424
BAR CODE READER SLIDE TL-3385

Test Points:

For ANALOG BOARD Configuration 1:

MULTIMETER TL-3424	
+	-
U2-7 on BAR CODE READER BOARD	TP4 or E3 on CONTROLLER BOARD

For ANALOG BOARD Configuration 2:

MULTIMETER TL-3424	
+	-
TP 3 on ANALOG BOARD	TP 7 on ANALOG BOARD

POTENTIOMETER: R1 on BAR CODE READER BOARD

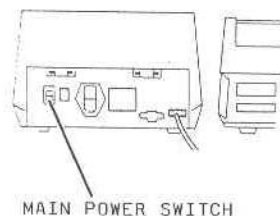
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To Check:

- [1] Move the MAIN POWER SWITCH up to the "1" position.
- [2] Execute option 70 to disable the COVER monitoring functions.



- [4] Is the ANALOG BOARD Configuration 1 or Configuration 2?

NOTE

Configuration 1 has a "PIGGY BACK" BOARD attached to the ANALOG BOARD. Configuration 2 has no "PIGGY BACK" BOARD.

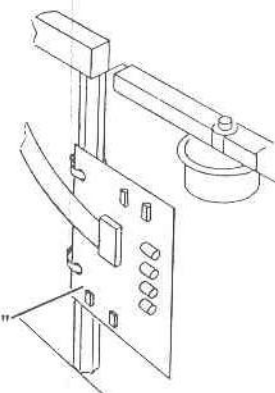


Advance to step 6.



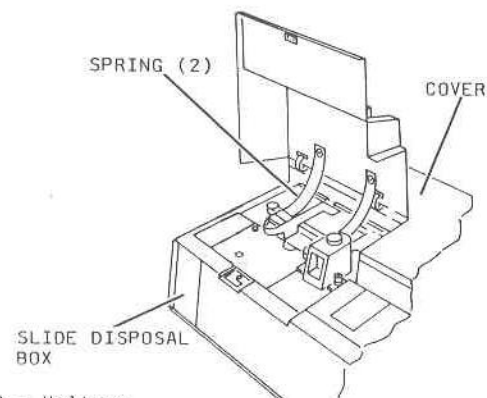
Advance to step 5.

"PIGGY BACK" BOARD



[3] Remove:

- 2 SPRINGS
- SLIDE DISPOSAL BOX
- COVER



Adjustment for BAR CODE READER - Voltage

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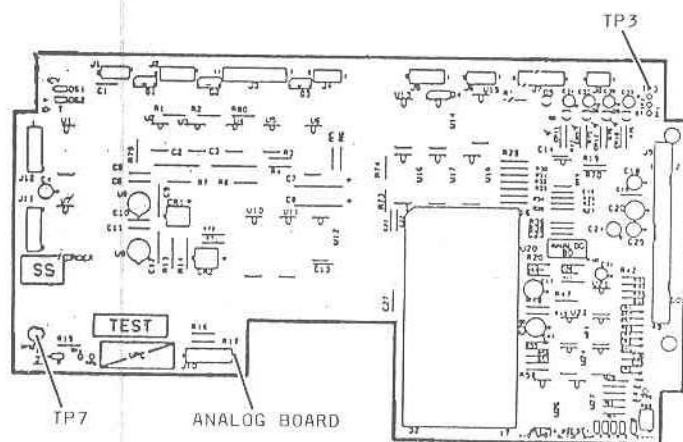
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[5] Connect the MULTIMETER TL-3424 and advance to step 7.

MULTIMETER TL-3424	
+	-
TP 3 on ANALOG BOARD	TP 7 on ANALOG BOARD



Adjustment for BAR CODE READER - Voltage

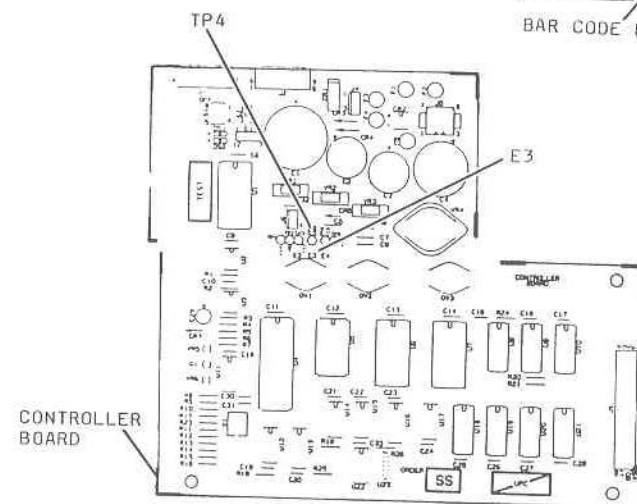
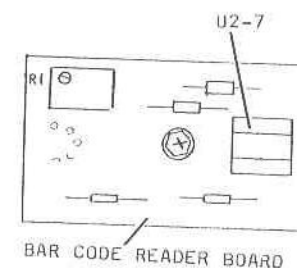
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[6] Connect the MULTIMETER TL-3424 and advance to step 7.

MULTIMETER TL-3424	
+	-
U2-7 on BAR CODE READER BOARD	TP4 or E3 on CONTROLLER BOARD



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- [7] Enter option 108, and if necessary, use option 108 to move the SLIDE TRANSPORT CLIP away from the Pickup Station.

Option 108 will prevent the slide from moving to the Hold Station.

- [8] Insert the BAR CODE READER SLIDE TL-3385 in the Pickup Station.

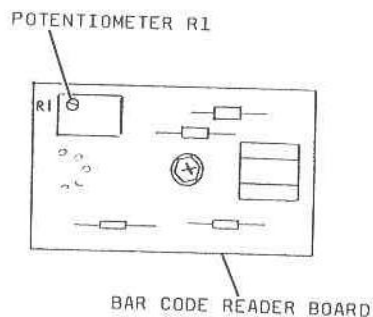
- [9] Is the voltage -5.75 to -6.25 V dc?

Yes
Advance to
step 11.

No
Advance to
step 10.

To Adjust:

- [10] Rotate POTENTIOMETER R1 on the BAR CODE READER BOARD until you obtain a voltage reading of -5.75 to -6.25 V dc.



- [11] Install:

- COVER
- SLIDE DISPOSAL BOX
- 2 SPRINGS

- [12] Press the following keys to return to normal operation:
- "shift"
 - "service mode"

NOTE

The DTSC MODULE will initialize.

- [13] Move the MAIN POWER SWITCH for the ANALYZER to "0" and then "1" to enable the COVER monitoring functions.
- [14] Insert slides for each available chemistry to check that the BAR CODE READER correctly reads each chemistry.

Adjustment for BAR CODE READER - Voltage

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TIP — Height

Purpose: The TIP in the PIPETTE must be at the specified height for correct operation. If the TIP is too high, the drop might adhere to the TIP and not be dispensed on the slide. If the TIP is too low, the TIP could cause damage the slide, or the TIP could prevent correct operation of the SPOT DETECTOR SENSOR.

Description : To obtain the correct adjustment you must:

- Use a special tool to measure the distance between the TIP SEAT and the PLATEN.
- Adjust the TIP SEAT to the correct height.

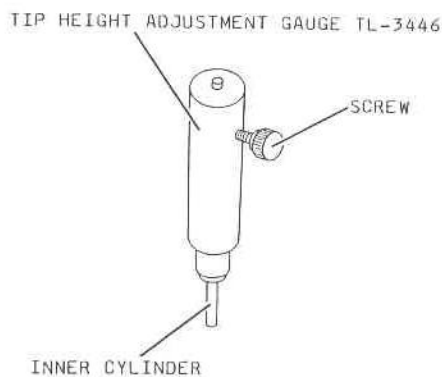
When to Do: - After installing a new PIPETTE LOCATOR.
- During the Checkout Procedure for the Slide Spotting System.

Specification: 0.086 to 1.02 mm (0.034 to 0.040 in.) from TIP to slide

Special Tools: TIP HEIGHT ADJUSTMENT GAUGE TL-3446
SEALANT TL-2425
HEX WRENCH TL-1607, 5/32 in.

To Check:

- [1] Remove any slide from the Spotting Station.
- [2] Loosen the SCREW on the TIP HEIGHT ADJUSTMENT GAUGE TL-3446 until the INNER CYLINDER moves freely.



Adjustment for TIP - Height

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- [3] Insert the TIP HEIGHT ADJUSTMENT GAUGE TL-3446 into the PIPETTE LOCATOR.

- [4] Check that the INNER CYLINDER touches the PLATEN.

- [5] Is the INNER CYLINDER flush with the OUTER CYLINDER?



Advance to step 9.



Advance to step 6.

To Adjust:

- [6] Remove the TIP HEIGHT ADJUSTMENT GAUGE TL-3446 from the PIPETTE LOCATOR.

- [7] Use a 5/32 in. HEX WRENCH TL-1607 to rotate the TIP SEAT.

	decreases the height
	increases the height

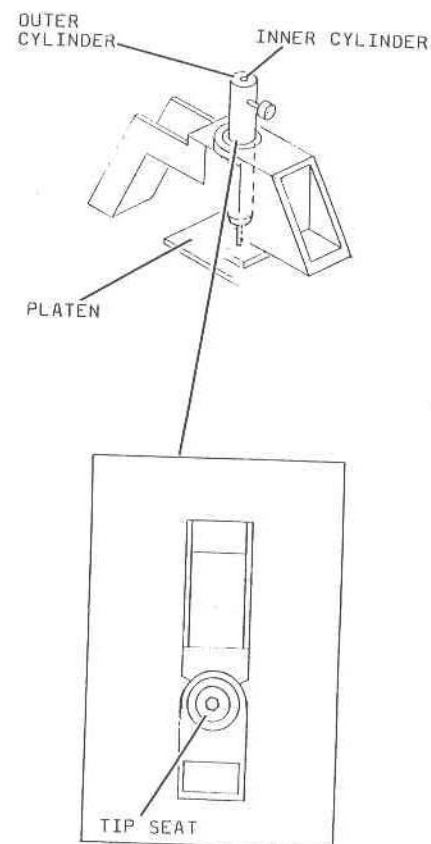
- [8] Do steps 3 to 5 again.

- [9] Remove the TIP HEIGHT ADJUSTMENT GAUGE TL-3446 from the PIPETTE LOCATOR.

- [10] If the TIP SEAT is very loose, apply SEALANT TL-2425.

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JACK SCREW — Height

Purpose: To provide support for the FLASH ASSEMBLY and to obtain the correct height of the TRACK ASSEMBLY.

Description: To obtain the correct adjustment, you must:

- Rotate the JACK SCREW until it supports the FLASH ASSEMBLY.
- Rotate the JACK SCREW an additional 1/4 rotation after it makes contact with the FLASH ASSEMBLY.

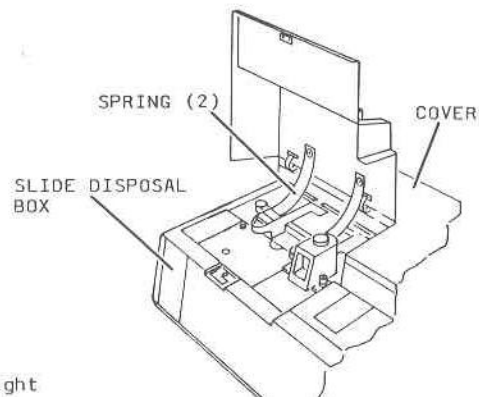
When to do:

- If the JACK SCREW is loosened when the FLASH ASSEMBLY is removed.
- When a new FLASH ASSEMBLY is installed.

Specification: The JACK SCREW should rotate an additional 1/4 rotation after it makes contact with the FLASH ASSEMBLY.

[1] Remove:

- 2 SPRINGS
- SLIDE DISPOSAL BOX
- COVER



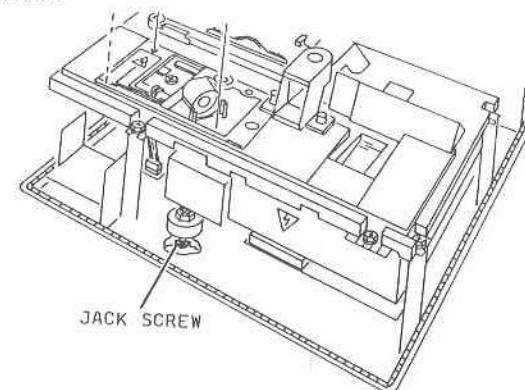
Adjustment for JACK SCREW - Height

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[2] Move the DTSC MODULE to a position that allows access to the JACK SCREW.

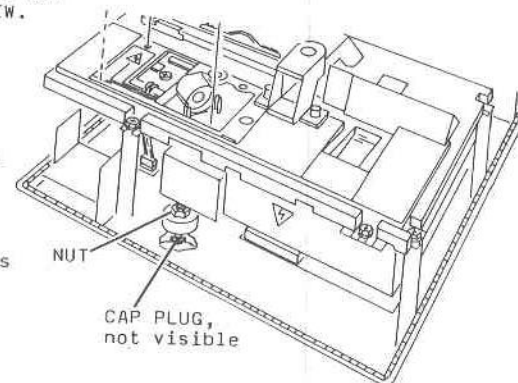


[3] If necessary, remove the CAP PLUG from the JACK SCREW.

[4] Loosen the NUT.

[5] Rotate the JACK SCREW counterclockwise 3 full rotations.

[6] Rotate the JACK SCREW clockwise until it makes contact with the FLASH ASSEMBLY.



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[7] Rotate the JACK SCREW an additional 1/4 rotation clockwise.

[8] Tighten the NUT.

[9] Install:

- CAP PLUG on the JACK SCREW
- COVER
- SLIDE DISPOSAL BOX
- 2 SPRINGS

Adjustment for JACK SCREW - Height

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FILTER WHEEL

Purpose: To decrease binds in the DRIVE MOTOR and FILTER WHEEL ASSEMBLY.

Description: To obtain the correct adjustment, you must:

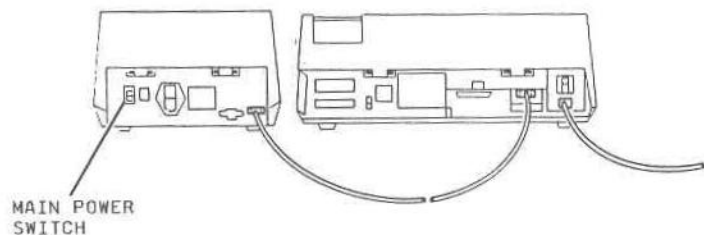
- Remove the FILTER WHEEL ENCLOSURE ASSEMBLY.
- Adjust the alignment of the MOTOR PINION GEAR and the FILTER WHEEL GEAR.

When to do: - When mechanical binds occur in the FILTER WHEEL ASSEMBLY and cause error codes.

Specification:

- The GEAR TEETH must engage for 360 degrees rotation without binds.
- The DTSC MODULE must initialize and calculate gains without error codes.

[1] Move the MAIN POWER SWITCH to the "0" position.



Adjustment for the FILTER WHEEL

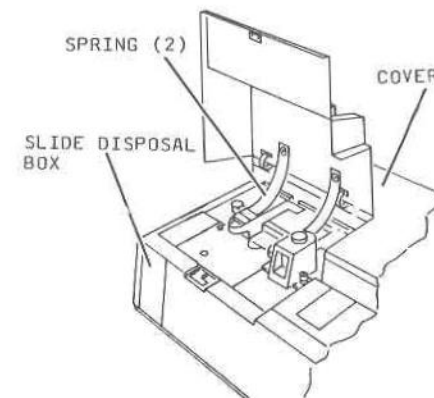
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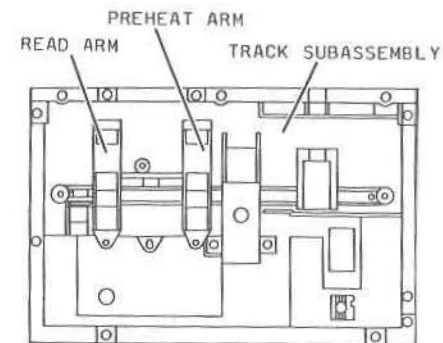
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[2] Remove:

- 2 SPRINGS
- SLIDE DISPOSAL BOX
- COVER



- READ ARM
- PREHEAT ARM
- TRACK SUBASSEMBLY

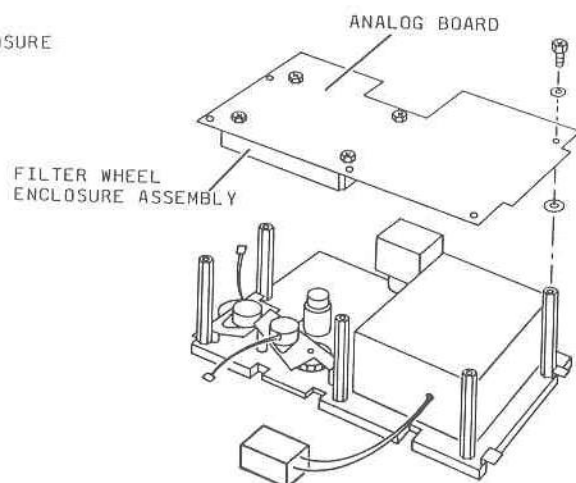


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- ANALOG BOARD
- FILTER WHEEL ENCLOSURE ASSEMBLY



[3] Loosen the 2 SCREWS.

[4] Move the DRIVE MOTOR toward the FILTER WHEEL to engage the PINION GEAR and the FILTER WHEEL GEAR.

[5] Tighten 1 SCREW.

[6] Lift the FILTER WHEEL ENCLOSURE ASSEMBLY vertically and rotate the FILTER WHEEL.

NOTE

Allow high points on the FILTER WHEEL to move the DRIVE MOTOR and PINION GEAR away from the FILTER WHEEL.

[7] Tighten the other SCREW.

[8] Do the FILTER WHEEL and PINION GEAR have binds?



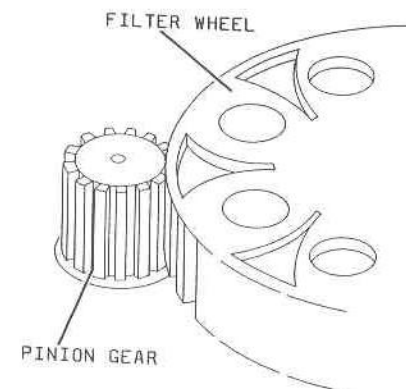
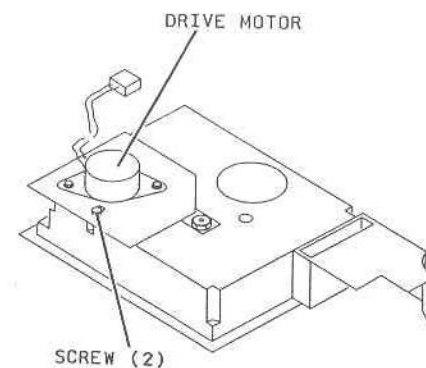
Yes

Do steps 3 to 8 again.



No

Advance to step 9.



Adjustment for the FILTER WHEEL

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[9] Are the TEETH on the FILTER WHEEL engaged for 360 degrees rotation?



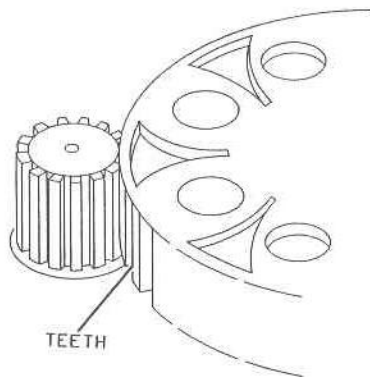
Yes

Advance to step 10.



No

Do steps 3 to 9 again, or install a new FILTER WHEEL ASSEMBLY.



[10] Install:

- FILTER WHEEL ENCLOSURE ASSEMBLY
- ANALOG BOARD
- TRACK SUBASSEMBLY
- PREHEAT ARM
- READ ARM
- COVER
- SLIDE DISPOSAL BOX
- 2 SPRINGS

[11] Move the MAIN POWER SWITCH to the "1" position.

Adjustment for the FILTER WHEEL

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Kodak Ektachem DTSC MODULE

Section 9 Special Procedures

PLEASE NOTE

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• CAUTION •

This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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Special Procedures

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DgProcedure.....	9.5
Interface Between Customer Computer and DT60 ANALYZER.....	9.9*

* This procedure is temporarily
included in the Service Publication
for the DTSC MODULE. It will be
included in a revised Service
Publication for the DT60 ANALYZER.

Correction Factors

Special Tools:

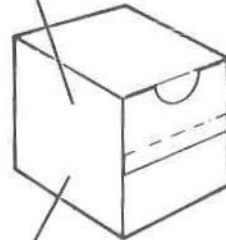
WHITE REFERENCE SLIDE TL-3575
BLACK REFERENCE SLIDE TL-3576

[1] Do the following procedure to enter the reflectance values for the correction factor calculation:

- Enter option 102.
- The white reference value for the first filter will be displayed.
- Press "clear".
- Enter the value for white reference that is given on the LABEL for the WHITE REFERENCE SLIDE TL-3575.
- The black reference value for the first filter will be displayed.
- Press "clear".
- Enter the value for black reference that is given on the LABEL for the BLACK REFERENCE SLIDE TL-3576.

LABEL for BLACK REFERENCE
SLIDE TL-3576

340 NM	0.0096 R	2.02 DR B
400 NM	0.0472 R	1.33 DR
460 NM	0.0489 R	1.31 DR
680 NM	0.0346 R	1.46 DR



340 NM	0.8235 R	.084 DR W
400 NM	0.8917 R	.050 DR
460 NM	0.9262 R	.033 DR
680 NM	0.9322 R	.030 DR

LABEL for WHITE REFERENCE
SLIDE TL-3575

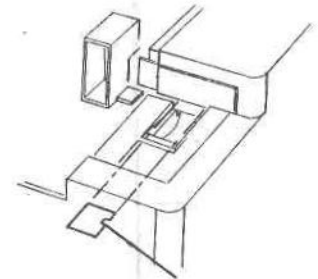
- Continue to enter the values for black reference and the white reference from the LABELS for all the filter positions that are displayed.

[2] Do the following procedure to calculate correction factors:

- Enter option 103.
- Insert the WHITE REFERENCE SLIDE TL-3575 and the BLACK REFERENCE SLIDE TL-3576 when the messages are displayed.

NOTE

Insert the REFERENCE SLIDES with the notch in the front right corner. See the figure.



NOTE

White correction factors are generally 0.080 to 1.05. Black correction factors are generally 0 to 0.1.

- [3] Compare the printout for option 103 with the LABELS for the WHITE and BLACK REFERENCE SLIDES. Are the reflectance values on the printout the same as the values on the LABELS?



The procedure is completed.



Advance to step 4.

- [4] Do the following procedure:

- Determine which reflectance values on the printout do not agree with the values on the LABEL.
- Execute option 102 again to enter again the value from the LABEL.

340 NM	0.0096 R	2.02 DR B
400 NM	0.0472 R	1.33 DR
460 NM	0.0489 R	1.31 DR
680 NM	0.0347 R	1.46 DR

LABEL for BLACK REFERENCE
SLIDES TL-3576

LABEL for WHITE REFERENCE
SLIDES TL-3575

340 NM	0.8235 R	.084 DR W
400 NM	0.8917 R	.050 DR
460 NM	0.9212 R	.033 DR
680 NM	0.9312 R	.030 DR

```

*****
DTSC
REFERENCE VALUES
*****
CORRECTION FACTORS
340 nm/B .0840
340 nm/W .1267
400 nm/B .0896
400 nm/W .1464
460 nm/B .0392
460 nm/W .0172
680 nm/B .0191
680 nm/W .0462
SLIDE REFLECTANCES
340 nm/W .8235
340 nm/B .0096
400 nm/W .8917
400 nm/B .0472
460 nm/W .0489
460 nm/B .0347
680 nm/W .9322
680 nm/B .0346
DTSC GAINS
*****
340- 0. 0.
400- 0. 0.
460- 0. 0.
680- 0. 0.
  
```

- [5] Do step 2 again to calculate the correction factors.

- [6] White correction factors are generally 0.080 to 1.05. Black correction factors are generally 0 to 0.1. Are the correction factors within the limits?



The procedure is completed. Advance to step 7.



- [7] Do the DR Procedure.

DR Procedure

Special Tools:

WHITE REFERENCE SLIDE TL-3575
BLACK REFERENCE SLIDE TL-3576

- [1] Do the following DR procedure to check the correction factors for the white reference:
- Enter option 106.
 - Enter the filter wavelength. Select any filter wavelength: 340, 400, 460, 680.
 - Enter type "1" for ratio test.
 - Enter "5" readings.
 - When the message is displayed, insert the WHITE REFERENCE SLIDE TL-3575.
- [2] Do step 1 again for all the other filter wavelengths.
- [3] When option 106 has been executed for all the filter wavelengths, check the printout. Is the mean DR values for each filter within 0.025 of the value for DR on the LABEL of the WHITE REFERENCE SLIDES TL-3575?



Advance to step 5.



Advance to step 4.

```

*****
FILTER  340
TYPE    1
OFST = 29010
REF = 29099

      DR      A/D
.058799    29104
.032060    29110
.032060    29110
.06809     29102
.12843     29090
-----
      MEAN
.063888    29103
-----
      STD. DEV.
.039484     8.198
*****
  
```

340 NM	0.8235 R	.084 DR W
400 NM	0.8917 R	.050 DR
460 NM	0.9262 R	.033 DR
680 NM	0.9322 R	.030 DR

LABEL for WHITE REFERENCE
SLIDES TL-3575

- [4] Do the following procedure:

- Execute option 103 again. Insert the REFERENCE SLIDES in response to the messages. New correction factors are calculated.
- Execute option 106 again for any filter wavelength that is in error.
- If the value on the printout is again out of limit, obtain help from TAC.

- [5] Do the following DR procedure to check the correction factors for the black reference:

- Enter option 106.
- Enter the filter wavelength. Select any filter wavelength: 340, 400, 460, 680.
- Enter type "1" for ratio test.
- Enter "5" readings.
- When the message is displayed, insert the BLACK REFERENCE SLIDE TL-3576.

- [6] Do step 5 again for all the other filter wavelengths.

- [7] When option 106 has been executed for all the filter wavelengths, examine the printout. Are the mean D_R values for all the filters within 0.050 of the value for D_R on the LABEL of the BLACK REFERENCE SLIDES TL-3575?



The procedure Advance to is completed. step 8.

- [8] Do the following procedure:

- Execute option 103 again. Insert the REFERENCE SLIDES in response to the messages. New correction factors are calculated.
- Execute option 106 again for any filter wavelength that is in error.
- If the value on the printout is again out of limit, obtain help from TAC.

```

*****
FILTER  340
TYPE    1
OFST =  319
REF = 28922

      DR      A/D
2.0078      521
2.0078      521
2.0066      522
2.0078      521
2.0091      520
-----
      MEAN      521
-----
      STD. DEV.
.0009083      .7072
*****
  
```

340 NM	0.0096 R	2.02 DR B
400 NM	0.0472 R	1.33 DR
460 NM	0.0489 R	1.31 DR
680 NM	0.0346 R	1.46 DR

LABEL for BLACK REFERENCE
SLIDES TL-3576

Interface Between Customer Computer and DT60 ANALYZER

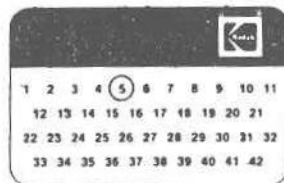
Purpose: This procedure will allow for an interface between the ANALYZER and the computer. The "Baud Rate", "Word Length", "Parity", "Stop Bits" and "Record Type" SWITCHES must be placed in the correct position on the I/O BOARD. The DCE/DTE JUMPER must be placed in the correct position on the ADAPTOR BOX ASSEMBLY.

Special Requirements: The information needed to set the SWITCHES and the JUMPER must be obtained from the customer. For more information, refer to Publication No. , Kodak DT60 Lab Computer Interface Specifications.

[1] Check that Modification No. 5 has been installed on the DT60 ANALYZER.

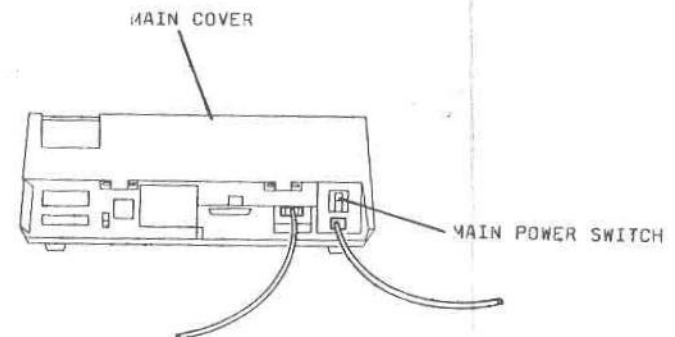
NOTE

Do not do this procedure if Modification No. 5 is not on the ANALYZER.



[2] Move the MAIN POWER SWITCH to the "0" position.

[3] Remove the MAIN COVER.



[4] Do the following to set the RS232 COMMUNICATIONS SWITCH on the I/O CIRCUIT BOARD ASSEMBLY:

NOTE

"0" indicates the SWITCH is in the "closed" position.

- Use the table to locate the correct "BAUD RATE".
- Using the information in the table, move the SWITCHES in position 6, 7, and 8 to the "open" or "closed" position.
- Use the table to locate the correct "WORD LENGTH", "PARITY", and "STOP BITS".
- Using the information in the table, move the SWITCHES in position 3, 4, and 5 to the "open" or "closed" position.
- To set the SWITCH for "CUSTOMER RECORD TYPE", move the SWITCH in position 2 to the "open" position.
- The SWITCH in position 1 can be in the "open" or "closed" position. Information is not needed for this SWITCH.

TABLE

1	2	3	4	5	6	7	8
0	0	1	0	1	0	1	0

SPARE

6	7	8	BAUD RATE
0	0	0	300
0	0	1	600
0	1	0	1200
0	1	1	1800
1	0	0	2400
1	0	1	3600
1	1	0	4800
1	1	1	9600

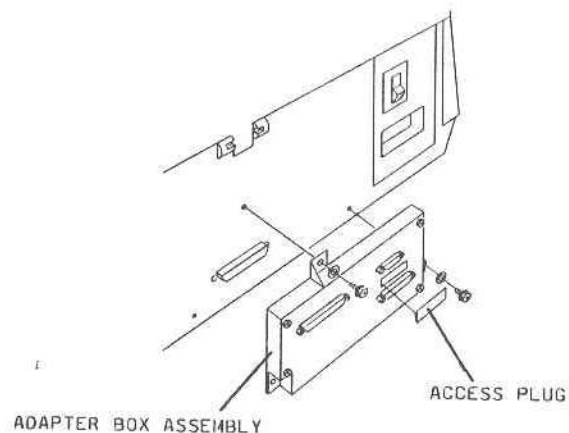
3	4	5	WORD LENGTH	PARITY	STOP BITS
0	0	0	7	Even	2
0	0	1	7	Odd	2
0	1	0	7	Even	1
0	1	1	7	Odd	1
1	0	0	8	None	2
1	0	1	8	None	1
1	1	0	8	Even	1
1	1	1	8	Odd	1

2	RECORD TYPE
0	Customer
1	Service

"0" = Switch Closed

[5] To make the PORT on the ANALYZER compatible to the customer's computer, do the following:

- Ask the customer if the computer specifications are for DCE no handshake, DCE handshake, or DTE?
- Remove the ACCESS PLUG from the ADAPTER BOX ASSEMBLY.
- Place the JUMPER in the correct position.
- Install the ACCESS PLUG.



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[6] Install the MAIN COVER.

[7] Move the MAIN POWER SWITCH to the "1" position.

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9.15

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Kodak Ektachem DTSC MODULE Parts/Removals Section 10

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***** CAUTION *****



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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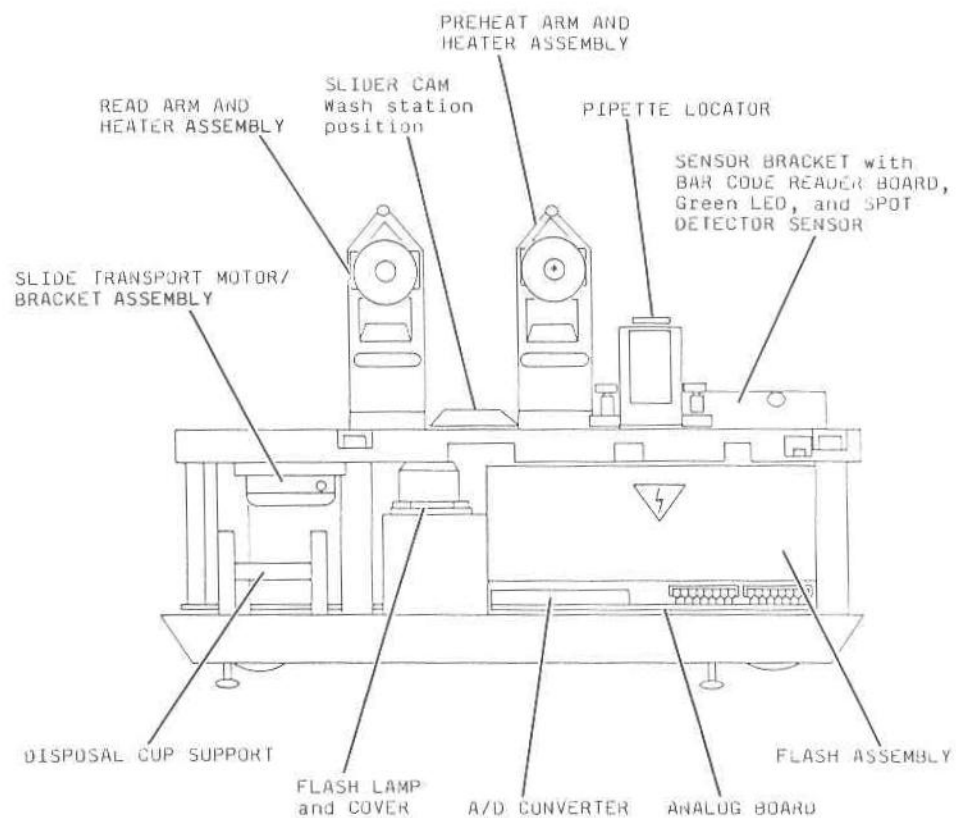


Figure 1 Front
XP3111-10, 2/87

10.1

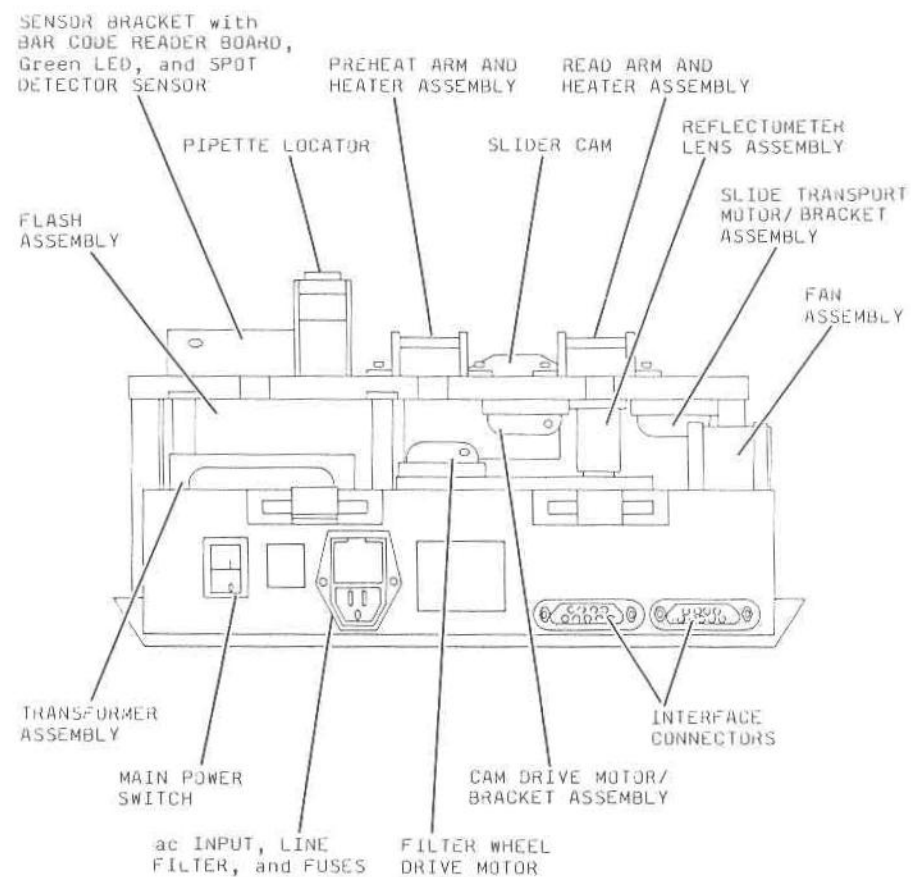


Figure 2 Back
XP3111-10, 2/87

10.2

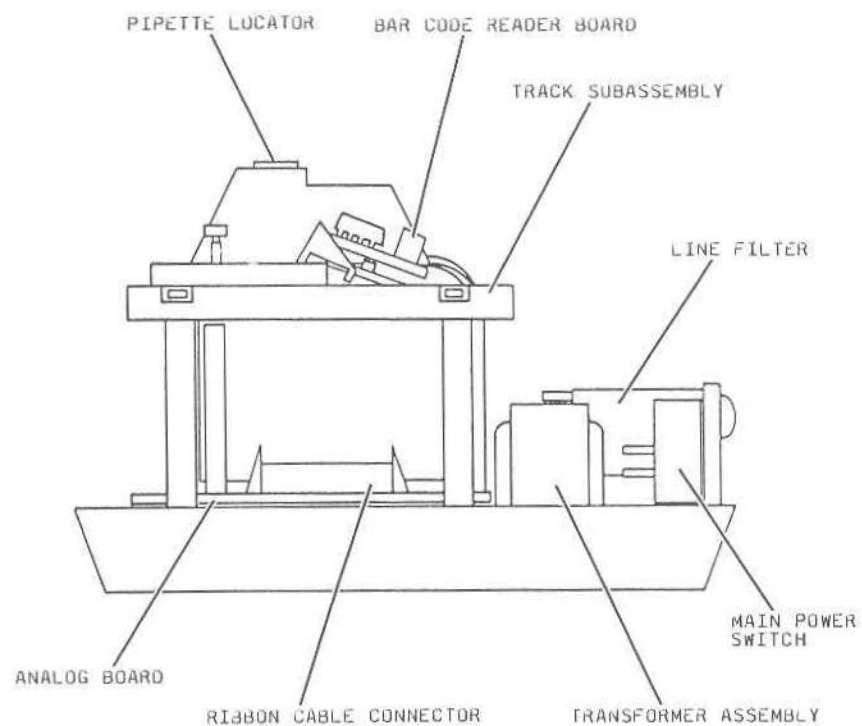


Figure 3 Right side

XP3111-10, 2/87

10.3

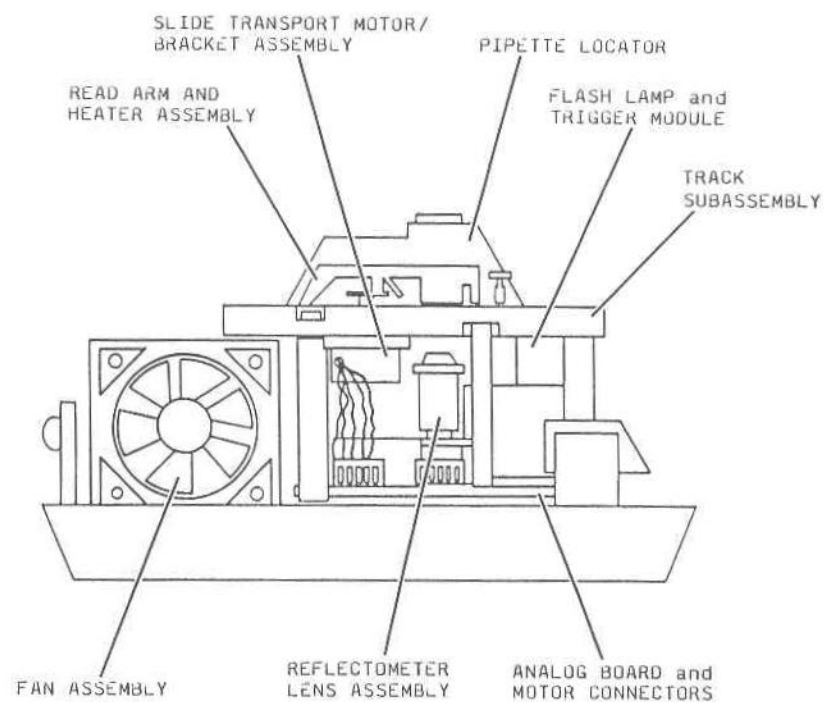


Figure 4 Left side

XP3111-10, 2/87

10.4

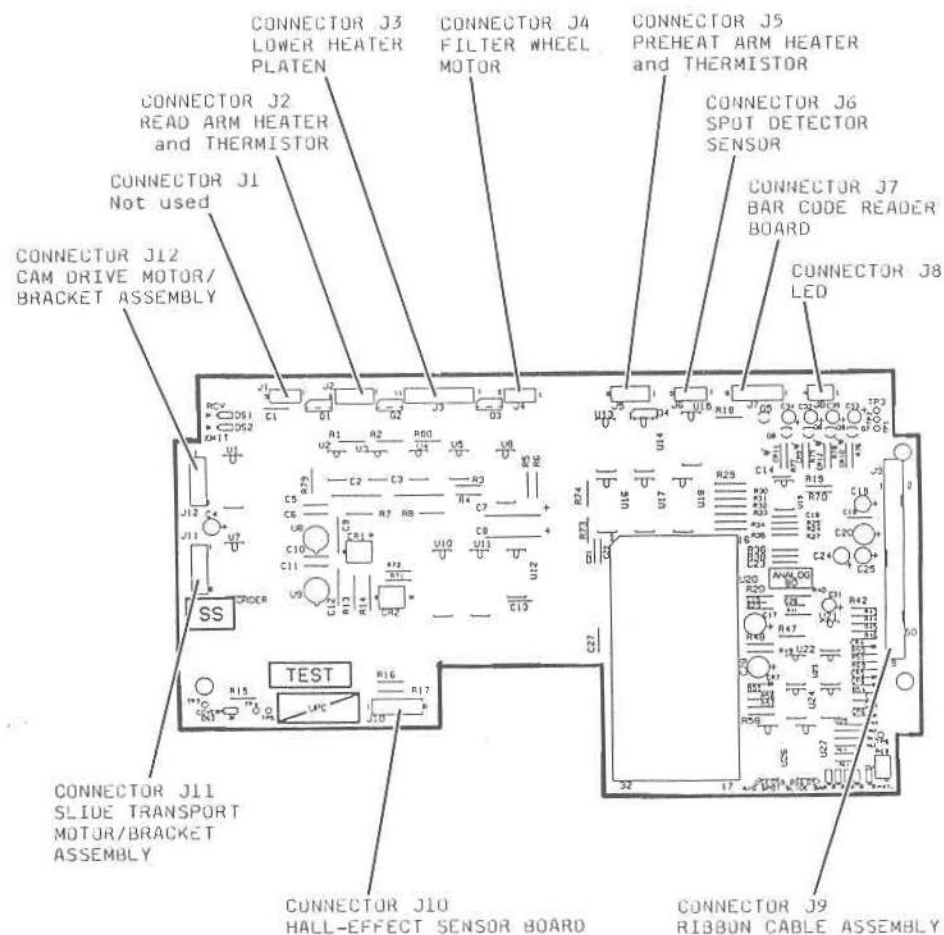


Figure 5 Position of the CONNECTORS on the ANALOG BOARD

XP3111-10, 2/87

10.5

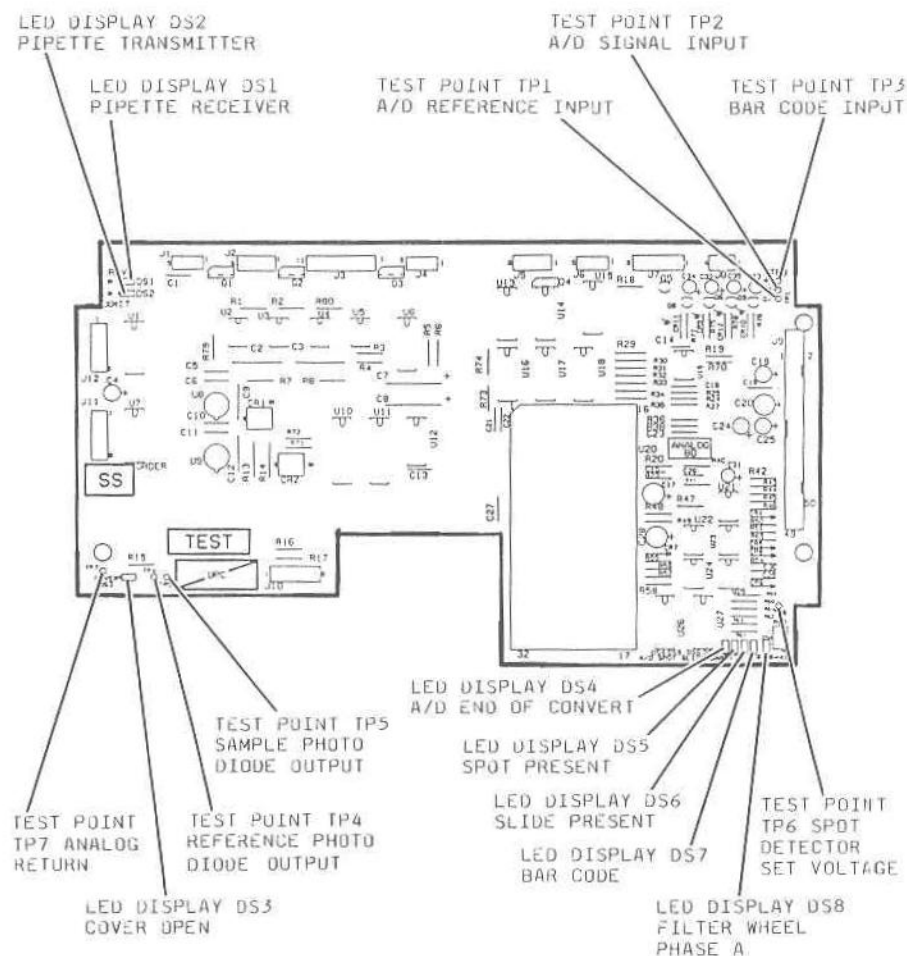


Figure 6 Position of the LED DISPLAYS and TEST POINTS on the ANALOG BOARD

XP3111-10, 2/87

10.6

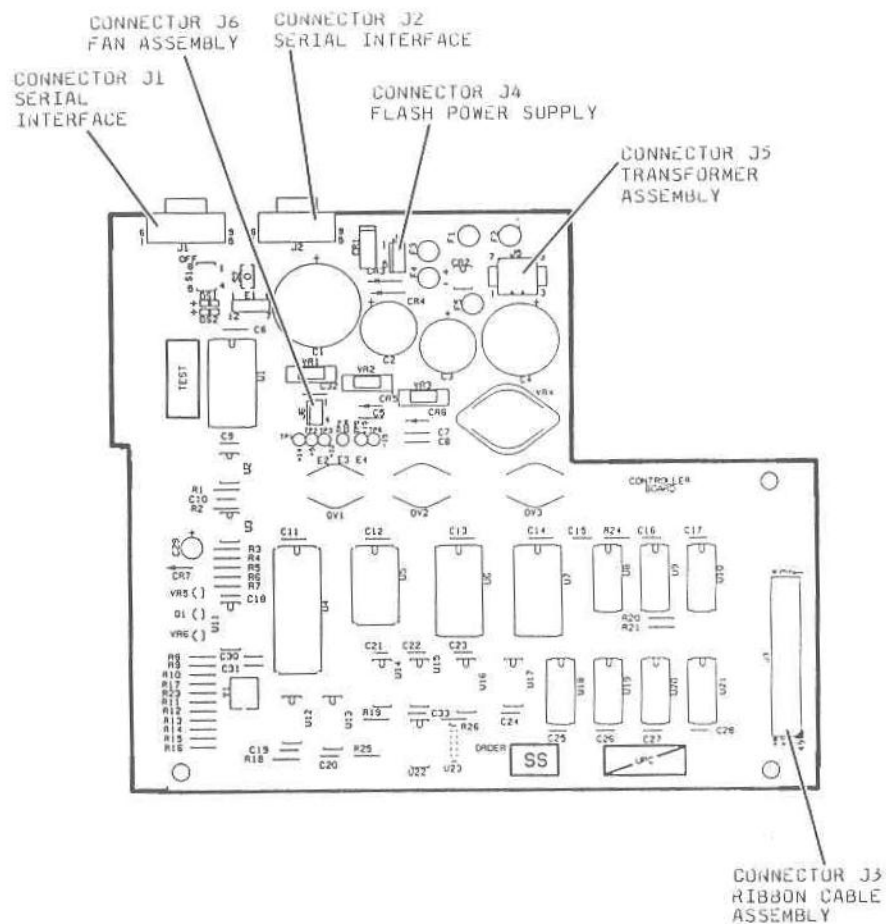


Figure 7 Position of the CONNECTORS on the CONTROLLER BOARD

XP3111-10, 2/87

10.7

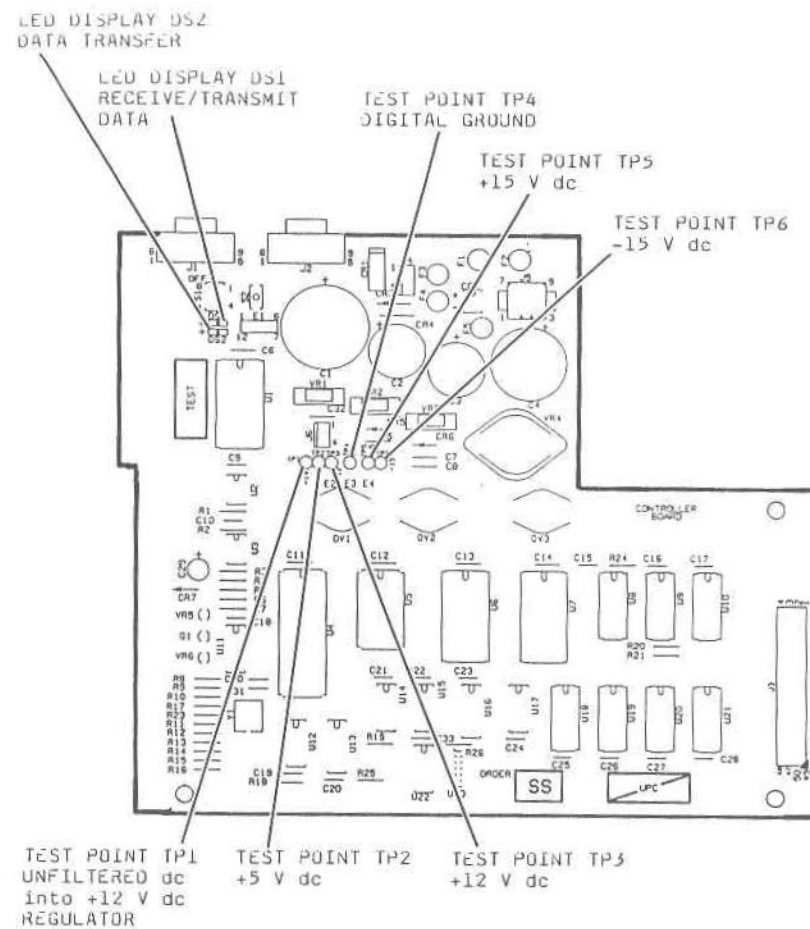


Figure 8 Position of the LED DISPLAYS and TEST POINTS on the CONTROLLER BOARD

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10.8

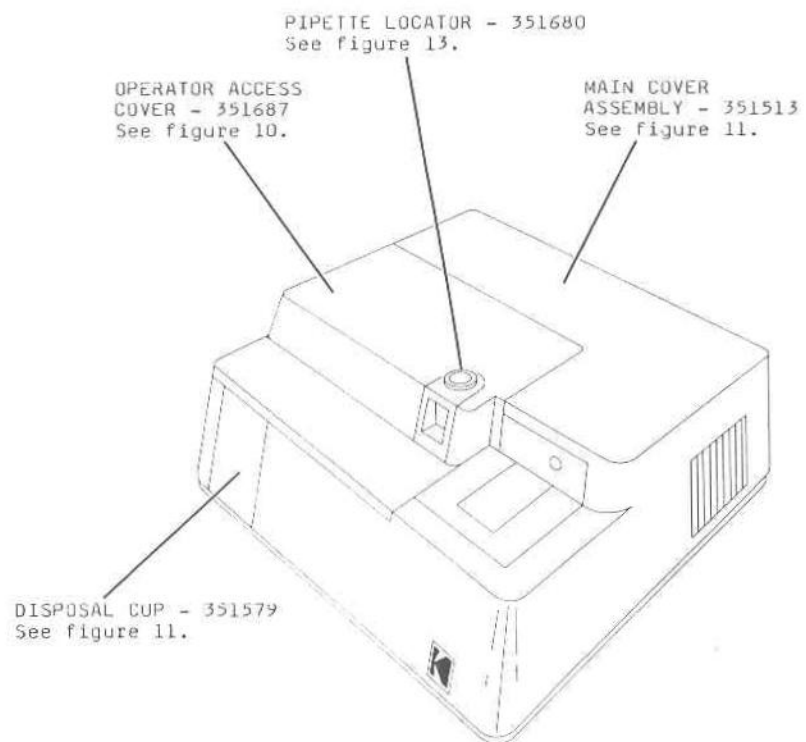


Figure 9

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Order by Part Number

10.9

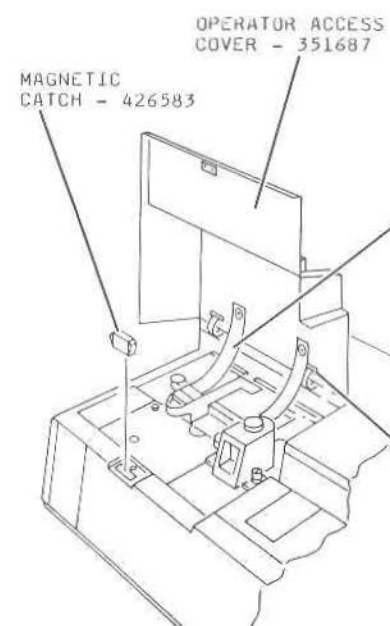
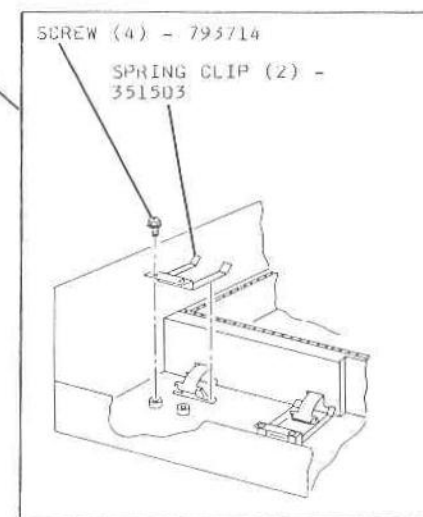
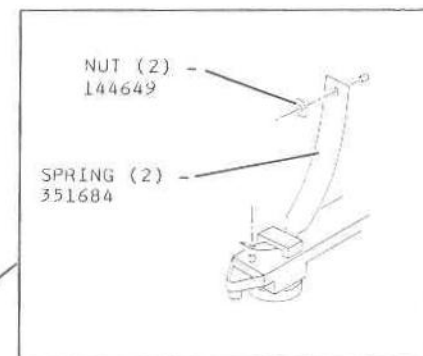


Figure 10

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Order by Part Number

10.10



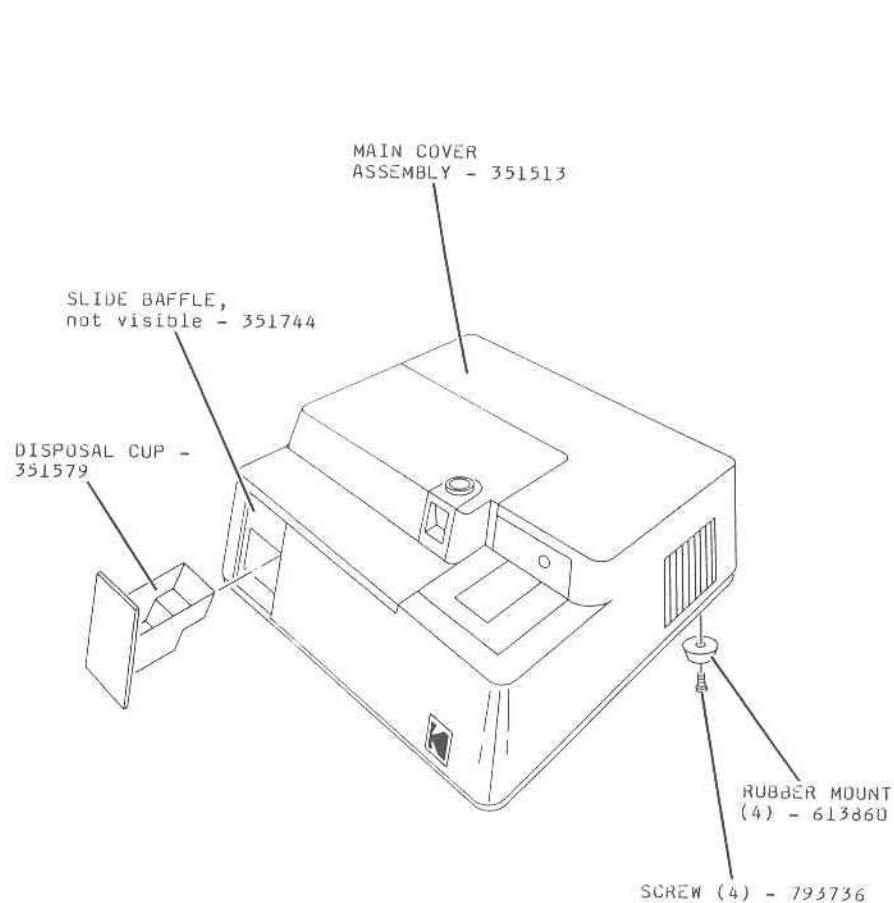
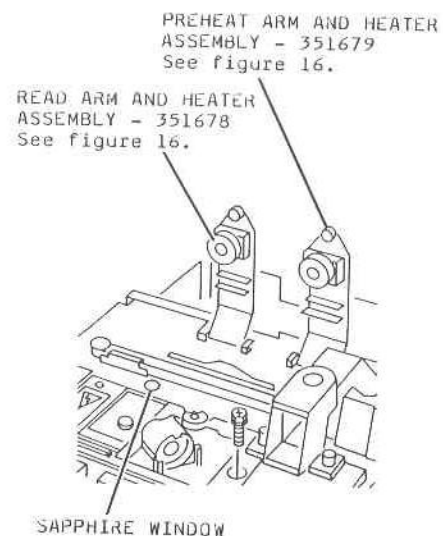


Figure 11

XP3111-10, 2/87

Order by Part Number

10.11



To remove the MAIN COVER ASSEMBLY

- [1] Loosen the 2 SCREWS 851825.
- [2] Open the OPERATOR ACCESS COVER.

.....
 • CAUTION •

Prevent damage to the
SAPPHIRE WINDOW.

- [3] Remove the SPRING from the PREHEAT ARM and from the READ ARM.

IMPORTANT

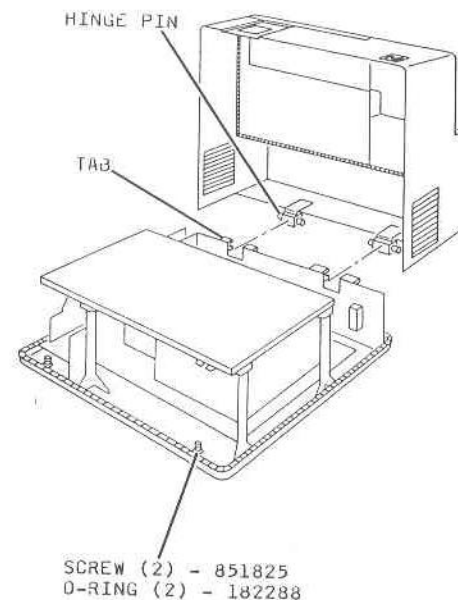
The ARMS must be down
before removing the MAIN
COVER ASSEMBLY.

- [4] Remove the DISPOSAL CUP.
- [5] Lift and remove the COVER and the 2 SPRINGS.

Figure 12

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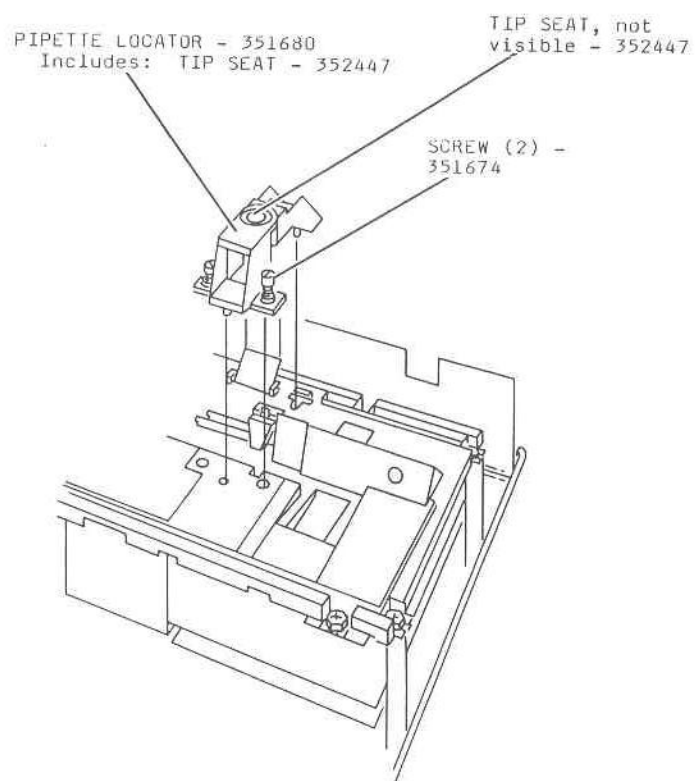
Order by Part Number



To install

- [1] Check that the OPERATOR ACCESS COVER is open.
- [2] Insert the HINGE PINS fully into the TABS.
- [3] Install the SPRINGS on the PREHEAT ARM and the READ ARM.
- [4] Close the OPERATOR ACCESS COVER.
- [5] Tighten the 2 SCREWS.

10.12



Adjustment specification for the height of the TIP

Specification: 0.086 to 1.02 mm (0.034 to 0.040 in.) from TIP to slide

Special Tool: TIP HEIGHT ADJUSTMENT GAUGE TL-3446

To remove the PIPETTE LOCATOR

- [1] Open the OPERATOR ACCESS COVER.
- [2] Loosen the 2 SCREWS.
- [3] Remove the PIPETTE LOCATOR.

Figure 13

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Order by Part Number

10.13

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10.14

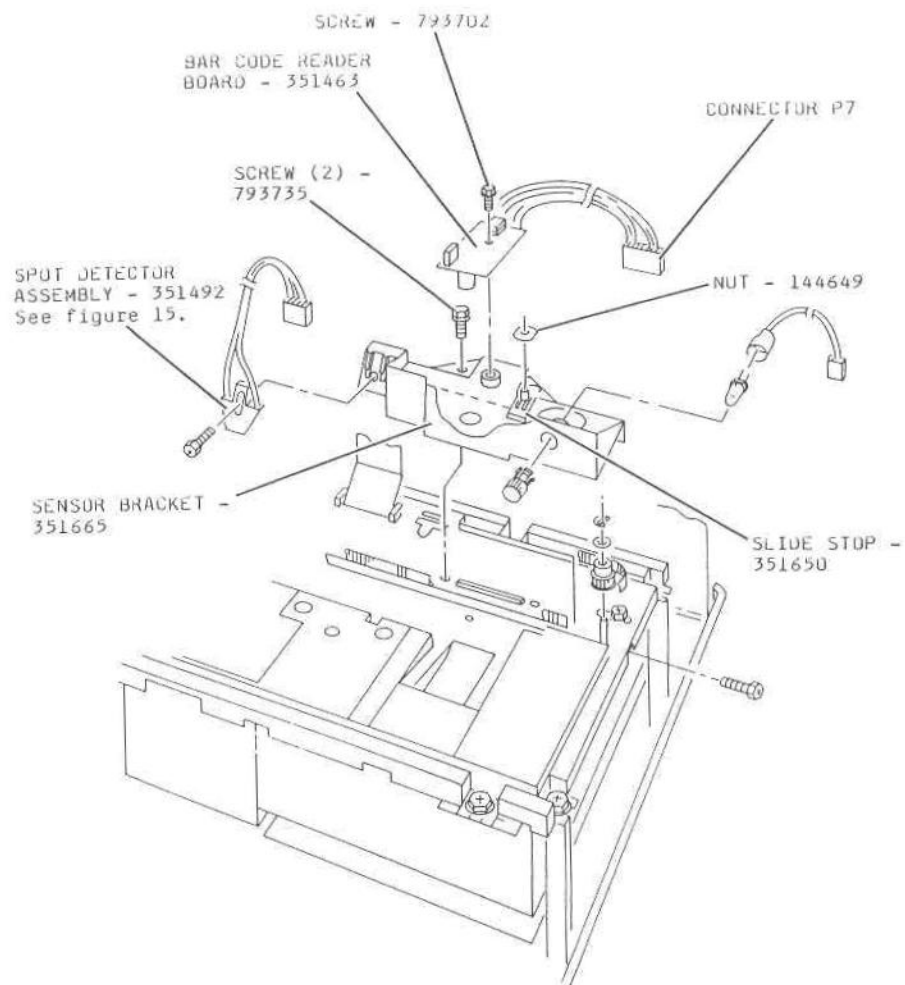


Figure 14

XP3111-10, 2/87

Order by Part Number

10.15

To remove the BAR CODE READER BOARD

[1] Remove:

- MAIN COVER ASSEMBLY, see figure 12
- PIPETTE LOCATOR, see figure 13

[2] Disconnect CONNECTOR P7.

[3] Remove the SCREW 793702 and BAR CODE READER BOARD.

Adjustment specification for the BAR CODE READER BOARD

Specifications:

-5.75 to -6.25 V dc with the BAR CODE READER SLIDE TL-3482
DARK voltage less than -2.4 V dc

Test Points:

ANALOG BOARD Configuration 2

MULTIMETER TL-3424	
+	-
TP3	TP7

ANALOG BOARD Configuration 1

MULTIMETER TL-3424	
+	-
U2-7 on BAR CODE READER BOARD	TP4 or E3 on CONTROLLER BOARD

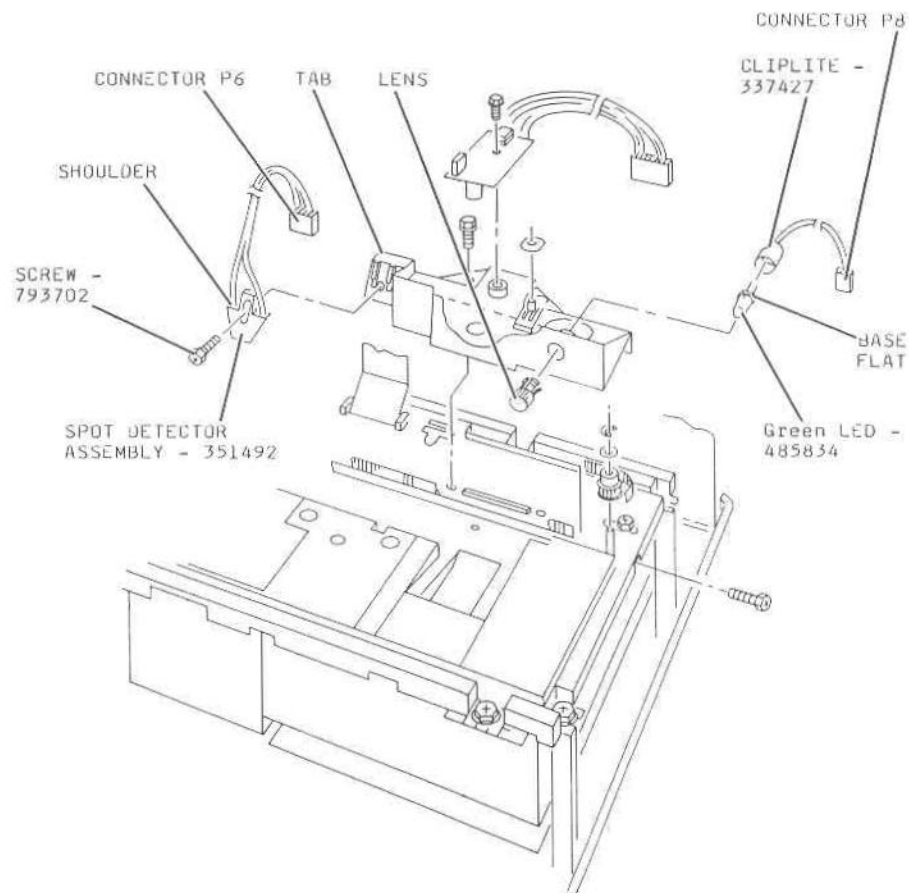
POTENTIOMETER: R1 on the BAR CODE READER BOARD

NOTE

If the ANALOG BOARD is not the same as figure 6, see the adjustments section.

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10.16



To install the Green LED

- [1] Cut the wires for the LED to 6.985 mm (0.275 in.)
- [2] Insert the LED into the LENS of the CLIPLITE with the FLAT up.
- [3] Install the CLIPLITE with the black wire terminal aligned with the FLAT on the BASE of the LED.

Figure 15

To remove the SPOT DETECTOR ASSEMBLY

- [1] Remove:
 - MAIN COVER ASSEMBLY, see figure 12
 - PIPETTE LOCATOR, see figure 13
- [2] Disconnect CONNECTOR P6.
- [3] Remove the SCREW and SPOT DETECTOR ASSEMBLY.

To install

- [1] Place the SHOULDERS of the SPOT DETECTOR in position touching the TABS on the SENSOR BRACKET.
- [2] Install the SCREW.
- [3] Connect CONNECTOR P6 to the ANALOG BOARD.
- [4] Do the adjustment for the SPOT DETECTOR.

Adjustment specification for the SPOT DETECTOR

Specifications:

8.5 to 9.0 V dc with an NH₃ slide
8.3 to 8.8 V dc with a CK slide

Test Points:

ANALOG BOARD Configuration 2

MULTIMETER TL-3424	
+	-
TP6	TP7

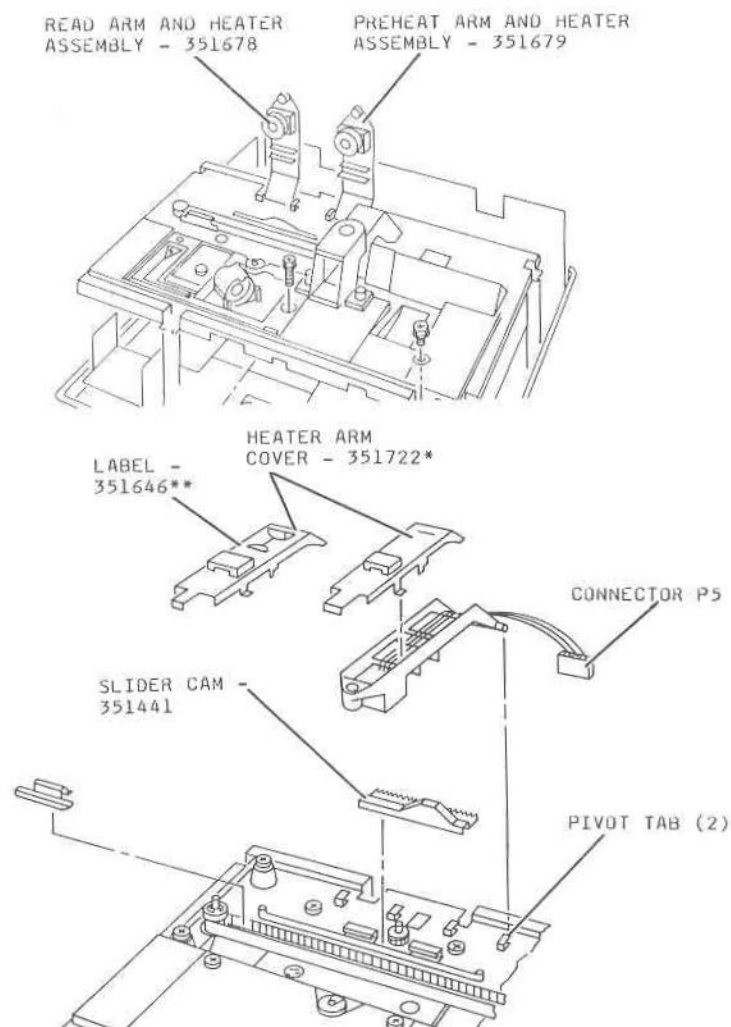
ANALOG BOARD Configuration 1

MULTIMETER TL-3424	
+	-
TP6	TP4 or E3 on CONTROLLER BOARD

POTENTIOMETER: R68 on the ANALOG BOARD

NOTE

If the ANALOG BOARD is not the same as figure 6, see the adjustments section.



- * Included in the READ ARM AND HEATER ASSEMBLY - 351678 and the PREHEAT ARM AND HEATER ASSEMBLY - 351679.
- ** Included in the READ ARM AND HEATER ASSEMBLY - 351678.

To remove the READ ARM AND HEATER ASSEMBLY or PREHEAT ARM AND HEATER ASSEMBLY

- [1] Remove the MAIN COVER ASSEMBLY. See figure 12.

.....
 • CAUTION •

Do not break the PIVOT TABS.

- [2] Lift the ARM a minimum amount.
- [3] Move the ARM back and out of the PIVOT TABS.
- [4] Disconnect CONNECTOR P2 or P5 from the ANALOG BOARD.

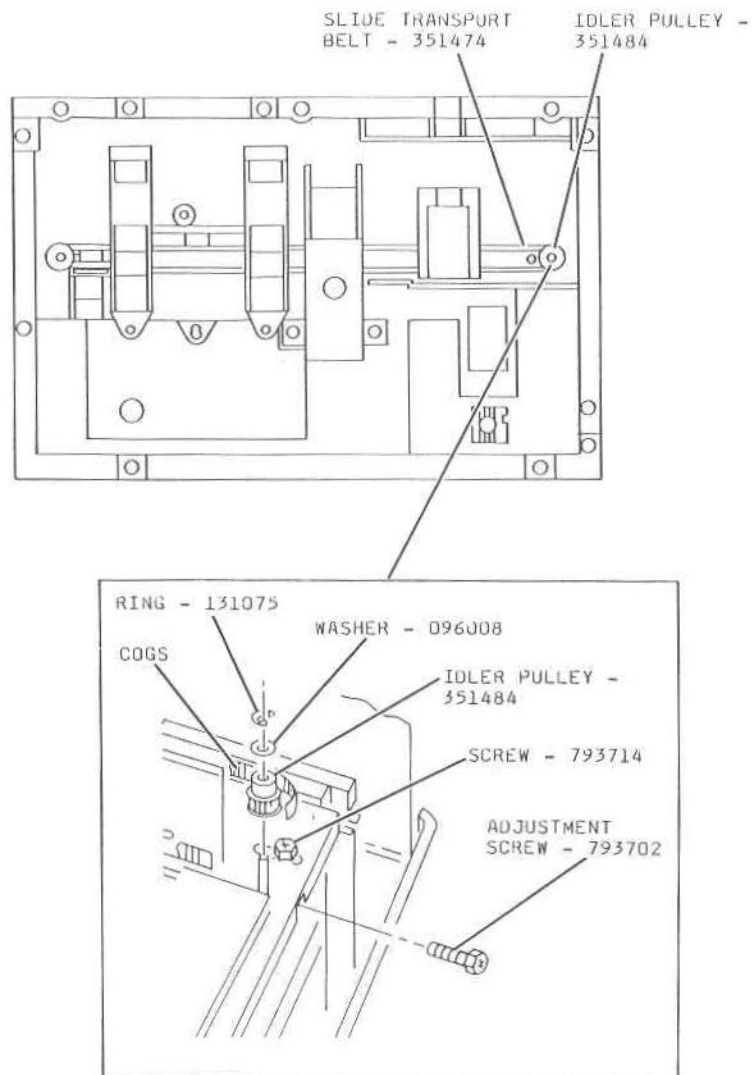
To install

.....
 • CAUTION •

Do not break the PIVOT TABS.

- [1] Place the ARM in an almost horizontal position and insert one side and then the other side under the PIVOT TABS.
- [2] Connect CONNECTOR P2 or P5 on the ANALOG BOARD.
- [3] Install the MAIN COVER ASSEMBLY. See figure 12.
- [4] Install the SPRINGS on the ARMS.
- [5] Do the D_R procedure.

Figure 16



To remove the SLIDE TRANSPORT BELT

- [1] Remove:
 - MAIN COVER ASSEMBLY, see figure 12
 - PIPETTE LOCATOR, see figure 13
 - READ ARM and PREHEAT ARM, see figure 16
- [2] Remove the 2 SCREWS and move the SENSOR BRACKET toward the back of the DTSC MODULE. See figure 14.
- [3] Loosen the SCREW 793714.
- [4] Loosen the ADJUSTMENT SCREW 793702.
- [5] Remove the BELT.

To install

- [1] Reverse the above procedure.
- [2] Do the adjustment for the tension of the BELT.

Adjustment specification for the tension of the BELT

Specification: 4.5 to 5.5 oz. force when the COGS touch

Special Tool: PUSH-PULL SCALE TL-1079

Measure the force between the PREHEAT ARM and the READ ARM

Figure 17

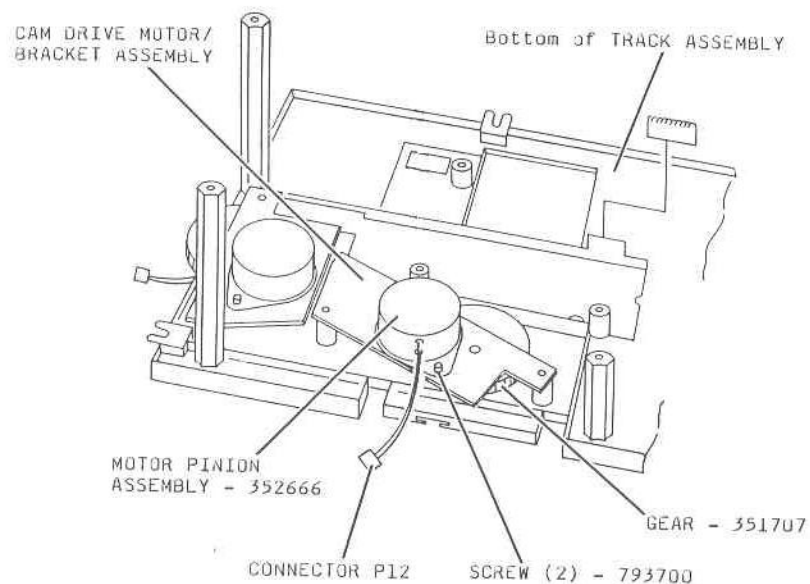
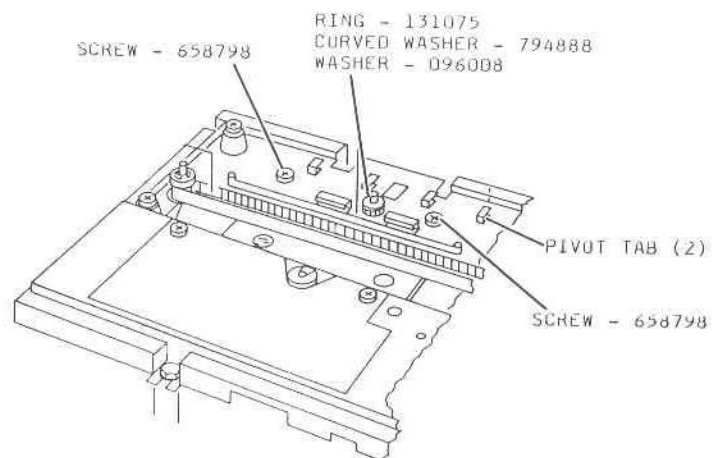


Figure 18

XP3111-10, 2/87

Order by Part Number

10.23

To remove the CAM DRIVE MOTOR/BRACKET ASSEMBLY and the MOTOR PINION ASSEMBLY

[1] Remove:

- MAIN COVER ASSEMBLY, see figure 12
- READ ARM AND HEATER ASSEMBLY, see figure 16
- TRACK SUBASSEMBLY, see figure 23

[2] Remove the SLIDER CAM.

[3] Remove the 2 SCREWS 658798.

[4] Disconnect CONNECTOR P12 from the ANALOG BOARD.

[5] Remove the CAM DRIVE MOTOR/BRACKET ASSEMBLY.

[6] Remove the 2 SCREWS 793700.

[7] Remove the MOTOR PINION ASSEMBLY.

To install

Reverse the above procedure.

XP3111-10, 2/87

10.24

SLIDE TRANSPORT
CLIP - 351720

RING - 131075
CURVED WASHER - 794888
CAP - 351711

SCREW - 658798

SCREW - 658798

COGS

SLIDE TRANSPORT MOTOR/
BRACKET ASSEMBLY

Bottom of TRACK ASSEMBLY

GEAR - 351707

CONNECTOR P11

SCREW (2) - 793700

MOTOR PINION
ASSEMBLY - 352666

Figure 19

XP3111-10, 2/87

Order by Part Number

10.25

To remove the SLIDE TRANSPORT MOTOR/BACKET ASSEMBLY and the MOTOR PINION ASSEMBLY

[1] Remove:

- MAIN COVER ASSEMBLY, see figure 12
- READ ARM and PREHEAT ARM, see figure 16
- TRACK SUBASSEMBLY, see figure 23

[2] Remove the SLIDE TRANSPORT BELT to prevent damage to it and to the SLIDE TRANSPORT CLIP. See figure 17.

[3] Disconnect CONNECTOR P11 from the ANALOG BOARD.

[4] Remove the 2 SCREWS 658798.

[5] Remove the SLIDE TRANSPORT MOTOR/BACKET ASSEMBLY.

[6] Remove the 2 SCREWS 793700.

[7] Remove the MOTOR PINION ASSEMBLY.

To install

[1] Reverse the above procedure.

[2] Check that the tension of the BELT is correct.

[3] If necessary, do the adjustment for the tension of the SLIDE TRANSPORT BELT.

Adjustment specification for the tension of the SLIDE TRANSPORT BELT

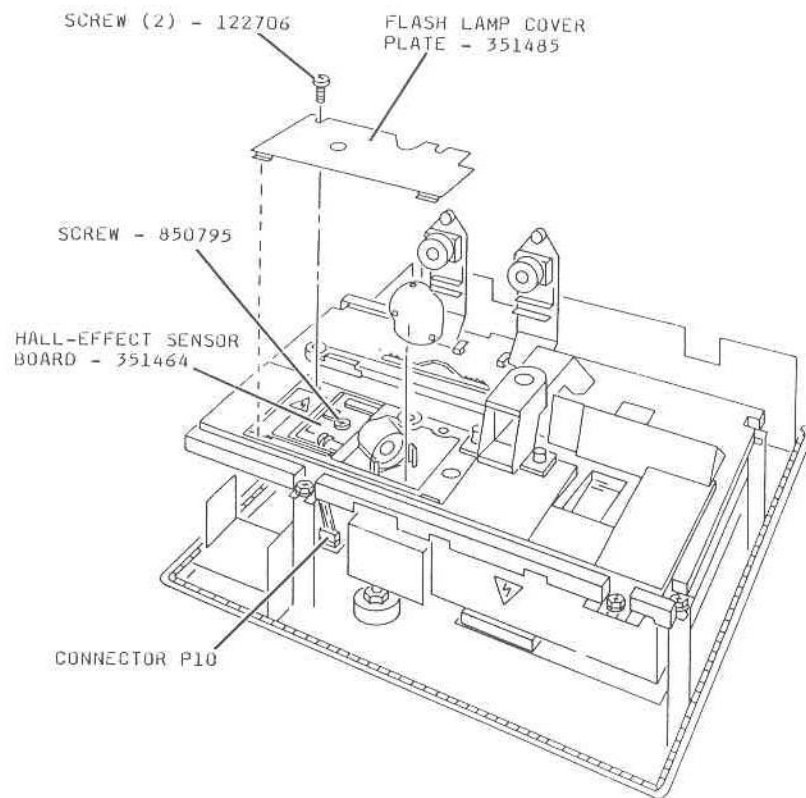
Specification: 4.5 to 5.5 oz. force when the COGS touch

Special Tool: PUSH-PULL SCALE TL-1079

Measure the force between the PREHEAT ARM and the READ ARM.

XP3111-10, 2/87

10.26



To remove the HALL-EFFECT SENSOR BOARD

- [1] Remove the MAIN COVER ASSEMBLY. See figure 12.
- [2] Move the READ ARM and the PREHEAT ARM up.
- [3] Remove:
 - 2 SCREWS 122706
 - FLASH LAMP COVER PLATE
 - SCREW 850795
- [4] Disconnect CONNECTOR P10 from the ANALOG BOARD.
- [5] Remove the HALL-EFFECT SENSOR BOARD.

To install

- [1] Reverse the above procedure.
- [2] Enter option 109 and observe LED DS3 on the ANALOG BOARD to check that the new HALL-EFFECT SENSOR BOARD operates correctly.

Specification

LED DS3	OPERATOR ACCESS COVER
ON	down
OFF	up

Figure 20

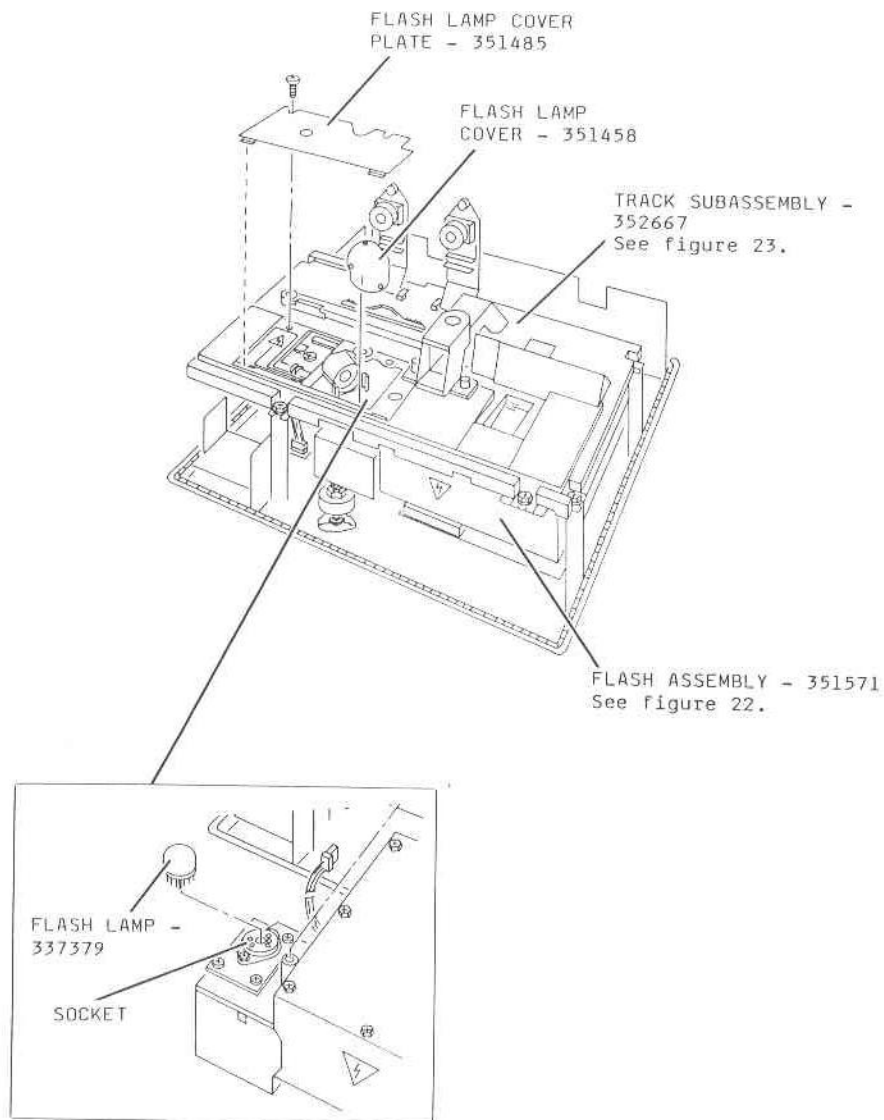


Figure 21

XP3111-10, 2/87

Order by Part Number

10.29

To remove the FLASH LAMP

- [1] Remove the MAIN COVER ASSEMBLY. See figure 12.
- [2] Remove the FLASH LAMP COVER PLATE.

.....
: CAUTION :
.....

Do not touch the reflective inner surface of the FLASH LAMP COVER.

- [3] Remove the FLASH LAMP COVER.

WARNING

The LAMP will explode if it falls.

- [4] Use the LAMP REMOVAL TOOL TL-3580 and remove the LAMP.
- [5] Insert the removed LAMP in the package of the new LAMP to discard it.

To install

- [1] Use the LAMP REMOVAL TOOL TL-3580 and seat the LAMP so that the bottom of the LAMP is flush with the SOCKET.
- [2] Visually adjust the vertical and horizontal position of the LAMP.
- [3] Install:
 - FLASH LAMP COVER
 - FLASH LAMP COVER PLATE
 - MAIN COVER ASSEMBLY

- [4] Enter option 106 or 120 to operate the FLASH 100 times.
- [5] Do option 106, Type 1 test, with no slide for 5 reads.
- [6] Are the results within the following specifications?

OR STD DEV: less than 0.00050
MAX GAIN: with Modification M1: less than 150
without Modification M1: less than 50
MAX OFST: 500



Advance to step 10.

Advance to step 7.

- [7] Do steps 4 and 5 again.
- [8] Are the results within the specifications?



Advance to step 10.

Advance to step 9.

- [9] Do steps 4 and 5 again for an additional 300 flashes.

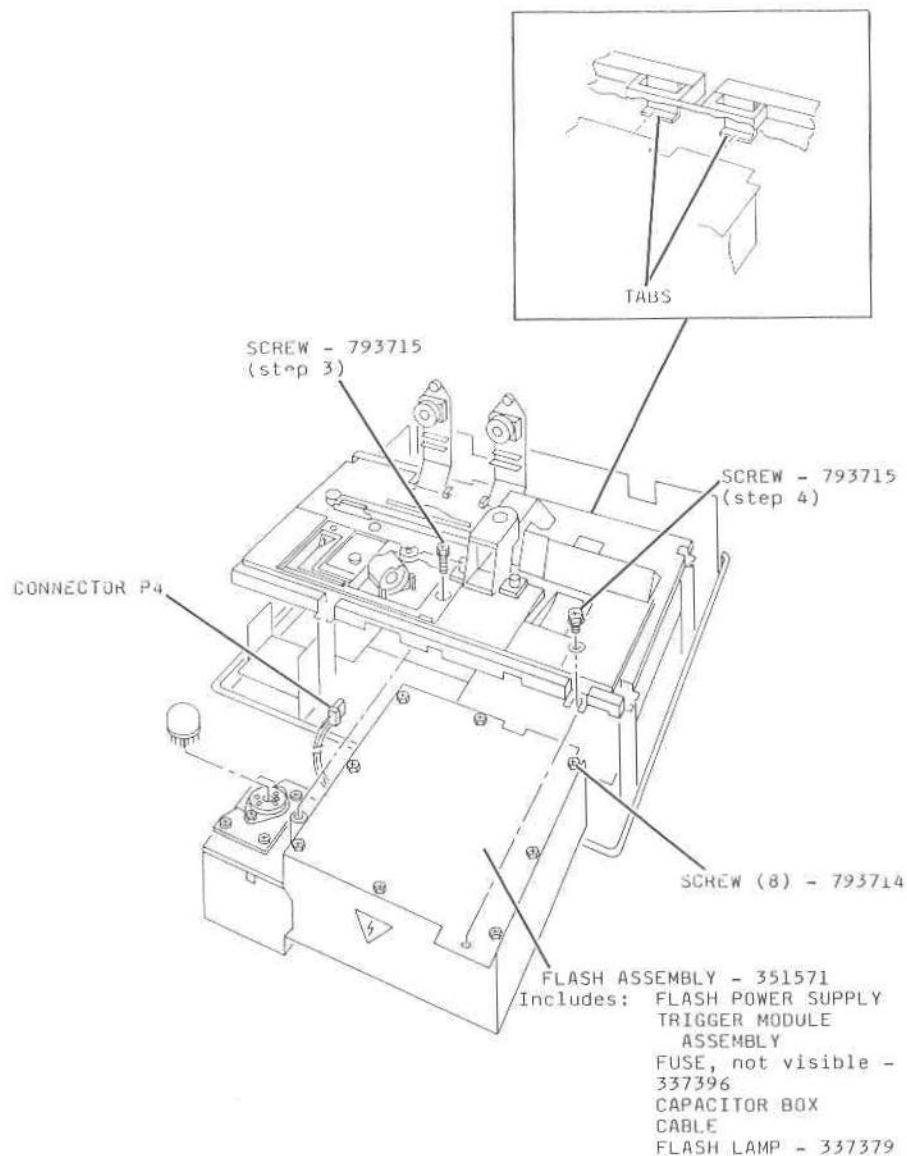
NOTE

Install a new FLASH LAMP if the specifications are not reached after a total of 500 flashes.

- [10] Do the DR procedure.
- [11] Process CONTROLS for all the rate chemistries the customer uses.

XP3111-10, 2/87

10.30



To remove the FLASH ASSEMBLY with CAPACITOR BOX

- [1] Move the MAIN POWER SWITCH to "0".
- [2] Remove:
 - MAIN COVER ASSEMBLY, see figure 12
 - READ ARM and PREHEAT ARM, see figure 16
 - TRACK SUBASSEMBLY, see figure 23
- [3] Remove the SCREW 793715 adjacent to the FLASH LAMP.
- [4] Loosen the SCREW 793715 in the right front corner.
- [5] Place the TRACK SUBASSEMBLY upside-down on the SUPPORTS.
- [6] Remove the ANALOG BOARD. See figure 24.
- [7] Move the FLASH ASSEMBLY and connected CAPACITOR BOX away from the TRACK SUBASSEMBLY.

To remove the FLASH ASSEMBLY without CAPACITOR BOX

- [1] Move the MAIN POWER SWITCH to "0".
- [2] Remove:
 - MAIN COVER ASSEMBLY, see figure 12
 - FLASH LAMP COVER PLATE, see figure 21
 - FLASH LAMP COVER, see figure 21
- [3] Remove the SCREW 793715 adjacent to the FLASH LAMP.
- [4] Loosen the SCREW 793715 in the right front corner.
- [5] Disconnect CONNECTOR P4 from the CONTROLLER BOARD.
- [6] Move the FLASH ASSEMBLY toward the front of the DTSC MODULE and remove it.

To install

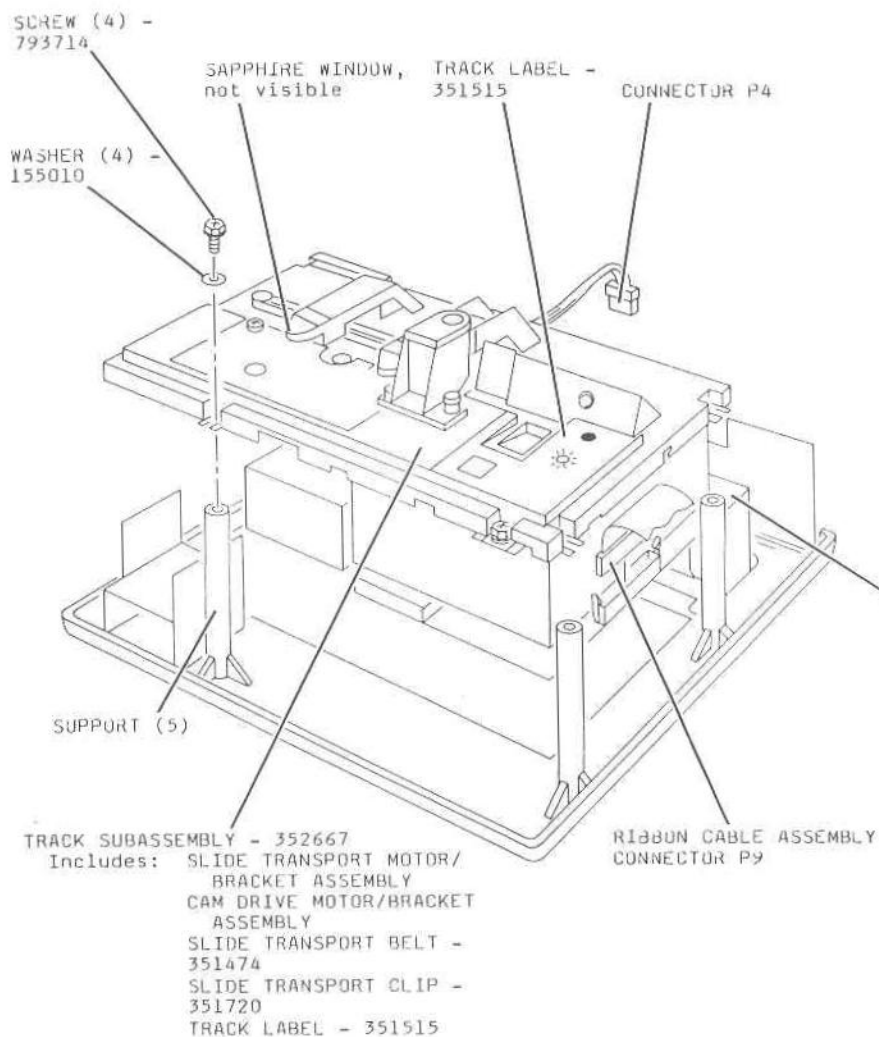
IMPORTANT

Install the FLASH ASSEMBLY so that the back edge seats on the TABS of the TRACK SUBASSEMBLY.

Hold the FLASH ASSEMBLY up to install the SCREW 793715 from step 3 above.

- [1] Reverse the above procedure.
- [2] Do the D_R procedure.

Figure 22



To remove the TRACK SUBASSEMBLY

- [1] Remove the MAIN COVER ASSEMBLY. See figure 12.
- [2] If necessary, loosen the 2 SCREWS and remove the CAPACITOR BOX.
- [3] Remove the 4 SCREWS and 4 WASHERS.
- [4] Disconnect:
 - RIBBON CABLE ASSEMBLY CONNECTOR P9
 - CONNECTOR P4 from the CONTROLLER BOARD

.....
CAUTION
.....

Prevent damage to the SAPPHIRE WINDOW.

- [5] Lift the TRACK SUBASSEMBLY vertically above the 5 SUPPORTS and remove the TRACK SUBASSEMBLY.

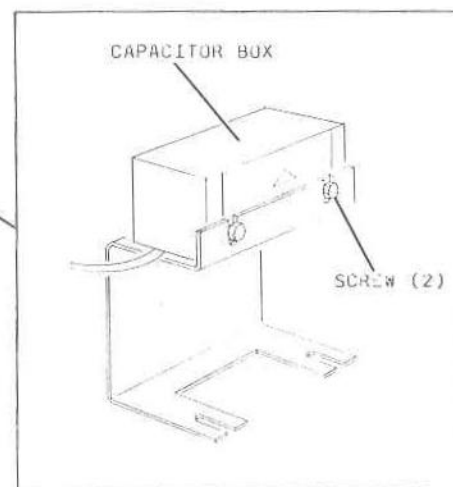


Figure 23

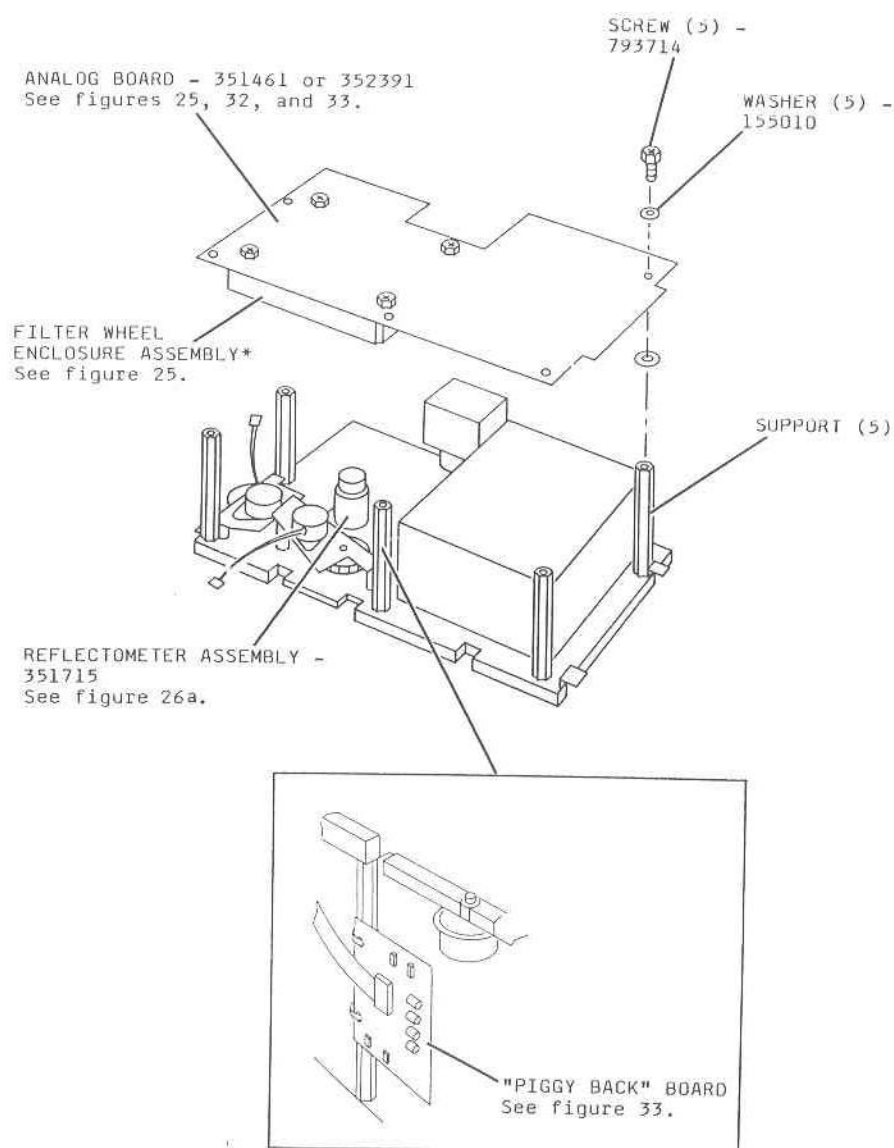


Figure 24

XP3111-10, 2/87

Order by Part Number

10.35

To remove the ANALOG BOARD

[1] Remove:

- MAIN COVER ASSEMBLY, see figure 12
- READ ARM and PREHEAT ARM, see figure 16
- TRACK SUBASSEMBLY, see figure 23

[2] Place the TRACK SUBASSEMBLY upside down on the SUPPORTS.

.....
CAUTION
.....

Possible damage from electrostatic discharge.

[4] Remove the 5 SCREWS and 5 WASHERS.

[5] Disconnect CONNECTORS P2, P3, P5 - P8, and P10 - P12 from the ANALOG BOARD.

[6] If necessary, disconnect the CONNECTOR for the "PIGGY BACK" BOARD from U15 on the ANALOG BOARD. See figure 33.

[7] Lift the ANALOG BOARD vertically from the REFLECTOMETER ASSEMBLY.

NOTE

If you install a new ANALOG BOARD, check that the PHOTO DIODES are clean. See figure 25.

To install

[1] Reverse the above procedure.

[2] If you installed a new ANALOG BOARD, do the adjustment for the SPOT DETECTOR. See the specifications on page 10.18.

[3] Do the Dg procedure.

XP3111-10, 2/87

10.36

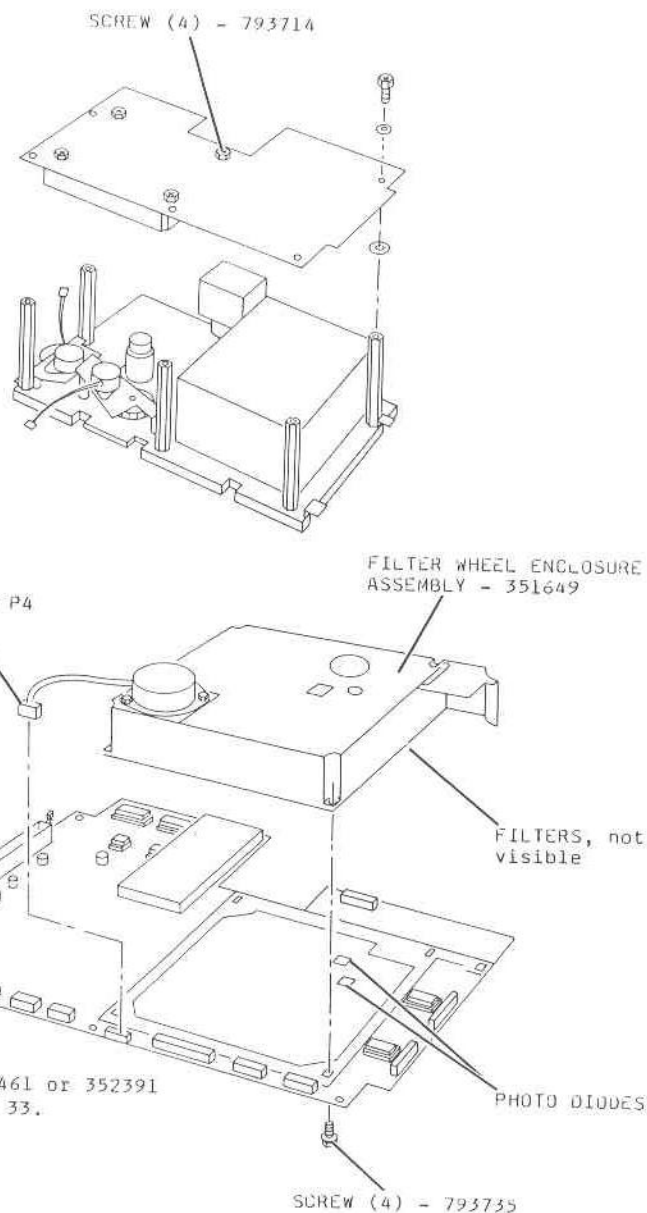


Figure 25

XP3111-10, 2/87

Order by Part Number

10.37

To remove the FILTER WHEEL ENCLOSURE ASSEMBLY

[1] Remove:

- MAIN COVER ASSEMBLY, see figure 12
- READ ARM and PREHEAT ARM, see figure 16
- TRACK SUBASSEMBLY, see figure 23
- ANALOG BOARD, see figure 24

[2] Remove the 4 SCREWS.

[3] Disconnect CONNECTOR P4 from the ANALOG BOARD.

[4] Remove the FILTER WHEEL ENCLOSURE ASSEMBLY.

To clean the PHOTO DIODES or FILTERS

.....
 • CAUTION •

Do not change the position of the PHOTO DIODES.

Do not touch the top surface of the PHOTO DIODES. The performance of the DTSC MODULE is affected by dirt on the PHOTO DIODES or the FILTERS.

Use a dry swab to clean the PHOTO DIODES.

Use only a dry swab to clean the FILTERS. If the FILTERS are excessively dirty, install a new FILTER WHEEL ENCLOSURE ASSEMBLY.

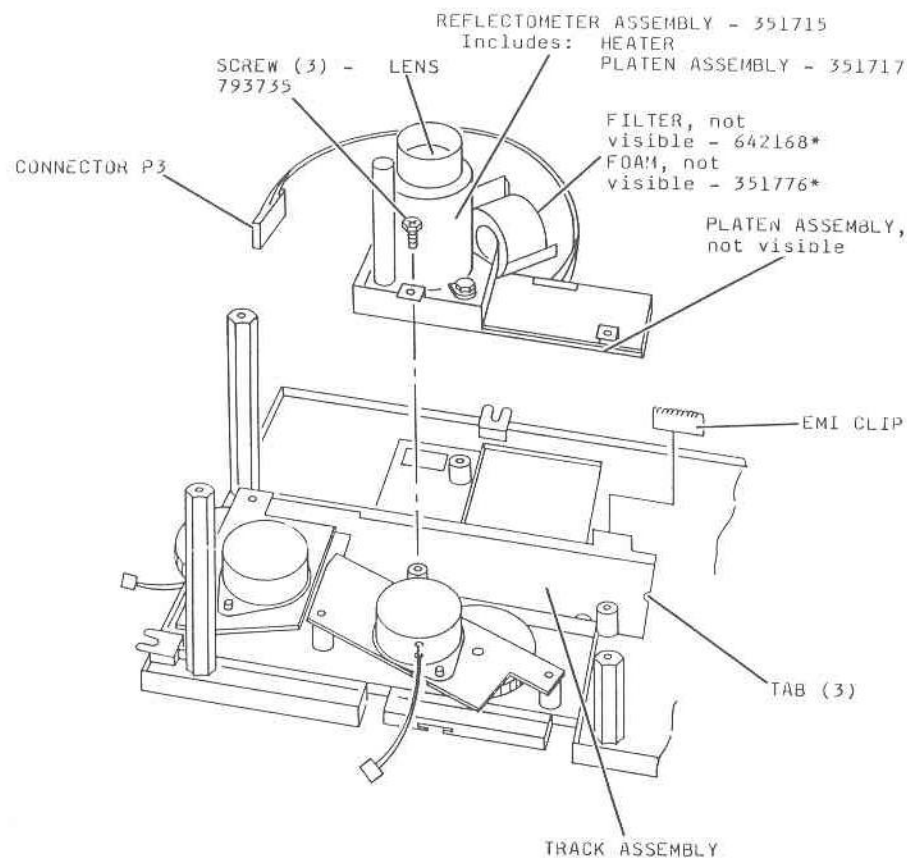
To install

[1] Reverse the above procedure.

[2] Do the DR procedure.

XP3111-10, 2/87

10.38



* Modification No. M1. Installed in manufacturing on serial number 62000665 and above.

Figure 26a

To remove the REFLECTOMETER ASSEMBLY

[1] Remove:

- MAIN COVER ASSEMBLY, see figure 12
- READ ARM and PREHEAT ARM, see figure 16
- FLASH ASSEMBLY, see figure 22
- TRACK SUBASSEMBLY, see figure 23
- ANALOG BOARD, see figure 24

[2] Remove the 3 SCREWS 793735.

[3] Remove the REFLECTOMETER ASSEMBLY.

[4] Remove the EMI CLIP.

To clean the lens or the FILTER

Use only a dry swab.

To install

[1] Install the REFLECTOMETER ASSEMBLY.

[2] Install, but do not tighten, the 3 SCREWS.

.....
: CAUTION :
.....

Prevent damage to the 3 TABS.

[3] Check that the edges of the PLATEN ASSEMBLY align with the 3 TABS.

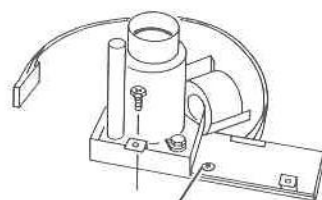
[4] Move the REFLECTOMETER ASSEMBLY toward the back of the TRACK ASSEMBLY.

[5] Tighten the 3 SCREWS.

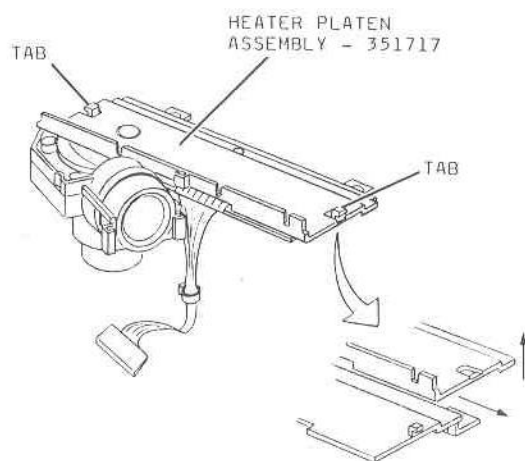
[6] Install:

- EMI CLIP
- ANALOG BOARD
- TRACK SUBASSEMBLY
- FLASH ASSEMBLY
- READ ARM and PREHEAT ARM
- MAIN COVER ASSEMBLY

[7] Do the DR procedure.



SCREW - 173597



To remove the HEATER PLATEN ASSEMBLY

- [1] Remove the REFLECTOMETER ASSEMBLY. See figure 26a.
- [2] Remove the SCREW.
- [3] Move the HEATER PLATEN ASSEMBLY from under the TAB.
- [4] Lift the PLATEN ASSEMBLY ↑ from the TAB.

To install

- [1] Install the PLATEN ASSEMBLY over 1 TAB.
- [2] Align the other TAB with the hole and press down on the PLATEN ASSEMBLY to fasten it.
- [3] Install, but do not tighten, the SCREW.
- [4] Move the PLATEN ASSEMBLY until the aperture has maximum roundness.
- [4] Tighten the SCREW.
- [5] Install the REFLECTOMETER ASSEMBLY.

Figure 26b

XP3111-10, 2/87

Order by Part Number

10.41

XP3111-10, 2/87

10.42

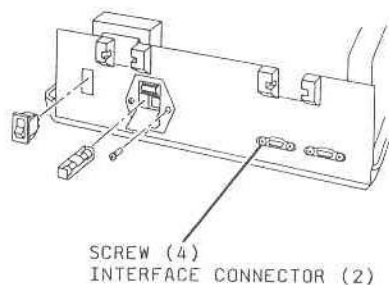
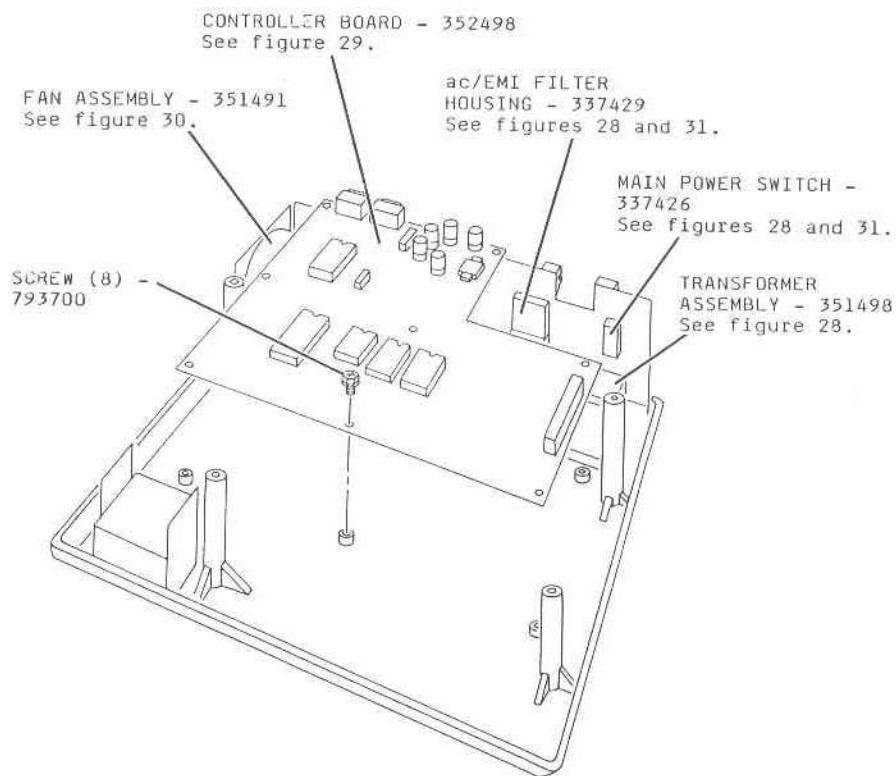


Figure 27

To remove the CONTROLLER BOARD

.....
: CAUTION :
.....

Possible damage from electrostatic discharge.

- [1] Remove:
 - MAIN COVER ASSEMBLY, see figure 12
 - TRACK SUBASSEMBLY, see figure 23
- [2] Remove:
 - 4 SCREWS from the 2 INTERFACE CONNECTORS
 - 8 SCREWS 793700
- [3] Disconnect CONNECTORS P5 and P6 from the CONTROLLER BOARD.
- [4] Move the CONTROLLER BOARD toward the front of the DTSC MODULE and from under the FAN ASSEMBLY.

To install

- [1] Place the CONTROLLER BOARD in the correct position.
- [2] Install:
 - 4 SCREWS for the INTERFACE CONNECTORS
 - 8 SCREWS
- [3] Connect CONNECTORS P5 and P6.
- [4] Install:
 - TRACK SUBASSEMBLY
 - MAIN COVER ASSEMBLY

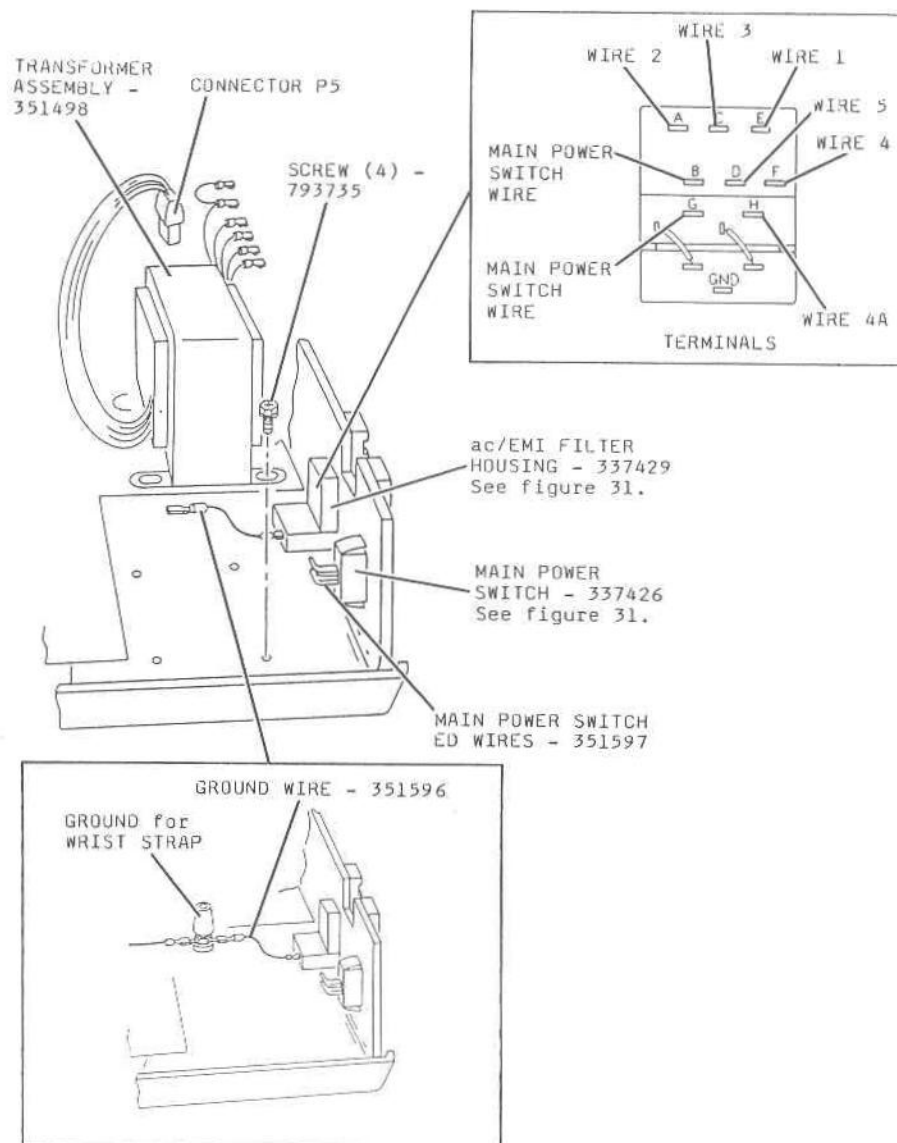


Figure 28

To remove the TRANSFORMER ASSEMBLY

WARNING

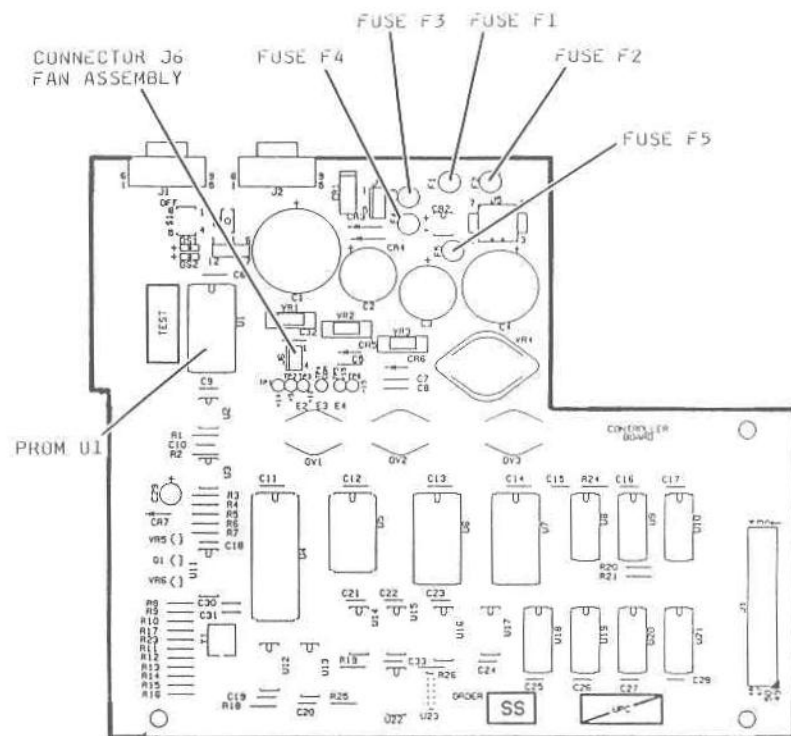
Dangerous Voltage

- [1] Disconnect the POWER CORD for the DTSC MODULE.
- [2] Remove:
 - MAIN COVER ASSEMBLY, see figure 12
 - TRACK SUBASSEMBLY, see figure 23
- [3] Remove the 4 SCREWS 793735
- [4] Remove the CAPACITOR BOX SUPPORT.
- [5] Disconnect:
 - CONNECTOR P5 from the CONTROLLER BOARD
 - ALL TERMINALS to the ac/EMI FILTER HOUSING
- [6] Remove the TRANSFORMER ASSEMBLY.

To install

IMPORTANT

The TERMINALS must be connected correctly.
Reverse the above procedure.



CONTROLLER BOARD - 352498		
Description		Part No.
FUSE	F1, F3, F4	337488
FUSE	F2, F5	337490
PROM	U1	351761*

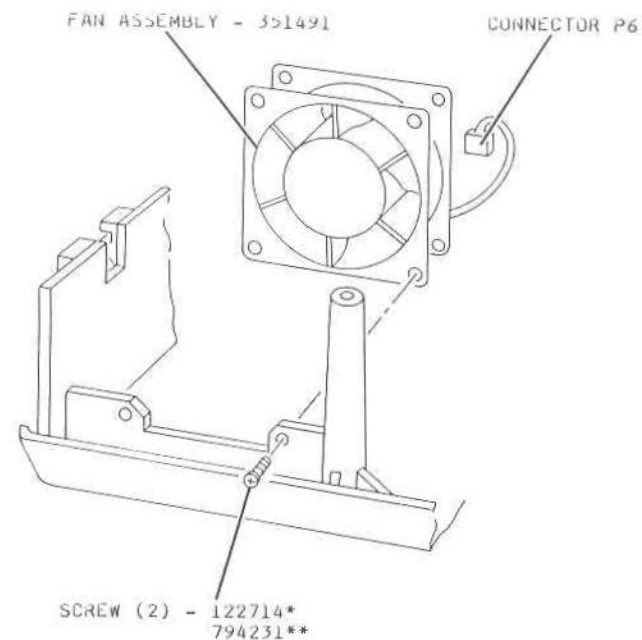
*Version 10.7 software.

Figure 29

XP3111-10, 2/87

Order by Part Number

10.47



* FAN ASSEMBLY with inserts.
** FAN ASSEMBLY without inserts.

To remove the FAN ASSEMBLY

- [1] Remove the 2 SCREWS at the bottom of the FAN ASSEMBLY.
- [2] Disconnect CONNECTOR P6 from the CONTROLLER BOARD.
- [3] Remove the FAN ASSEMBLY.

Figure 30

XP3111-10, 2/87

Order by Part Number

10.48

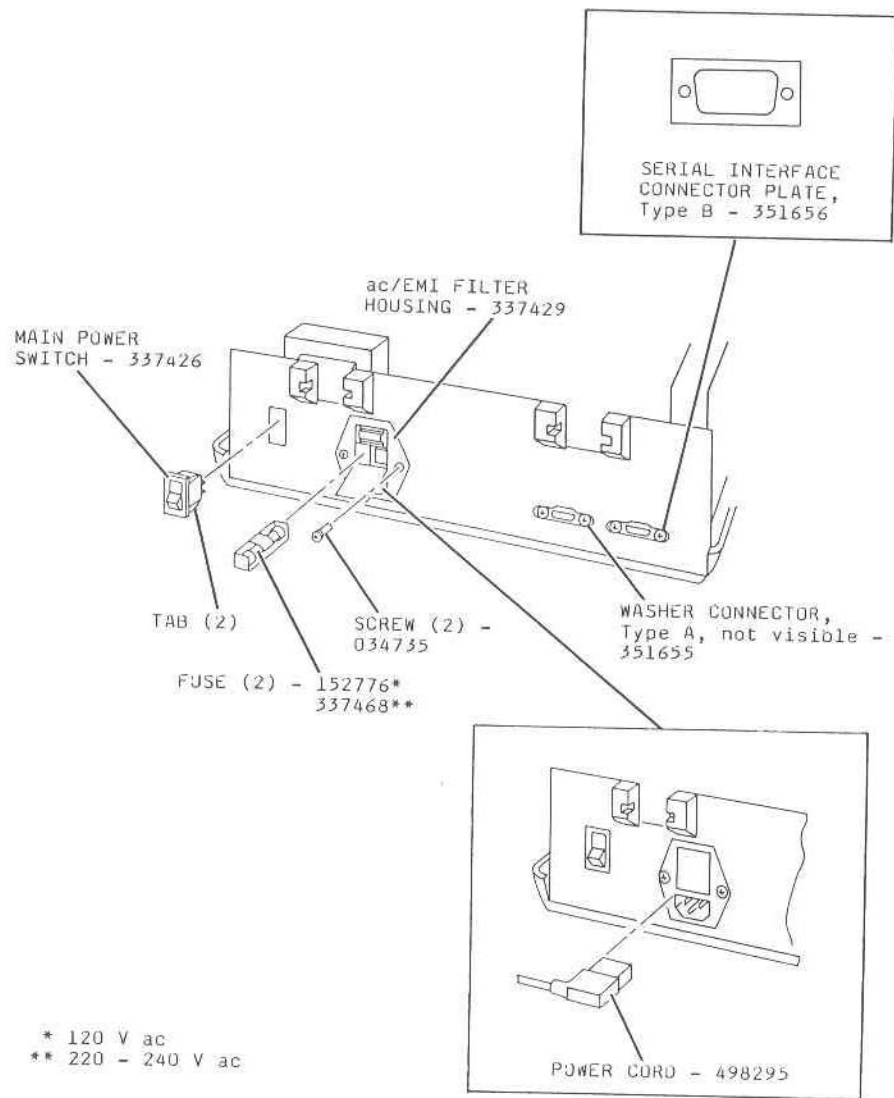


Figure 31

XP3111-10, 2/87

Order by Part Number

10.49

To remove the MAIN POWER SWITCH

- [1] Disconnect the POWER CORD from the DTSC MODULE.
- [2] Remove:
 - MAIN COVER ASSEMBLY, see figure 12
 - TRACK SUBASSEMBLY, see figure 23
- [3] Disconnect the TERMINAL for the SWITCH.
- [4] Press the TABS toward each other and move the SWITCH through the hole.

To install

Reverse the above procedure.

To remove the ac/EMI FILTER HOUSING

- [1] Disconnect the POWER CORD from the DTSC MODULE.
- [2] Remove:
 - MAIN COVER ASSEMBLY, see figure 12
 - TRACK SUBASSEMBLY, see figure 23
- [3] Disconnect all of the TERMINALS.
- [4] Remove the 2 SCREWS 034735.
- [5] Remove the ac/EMI FILTER HOUSING.

To install

IMPORTANT

The TERMINALS must be connected correctly. See figure 28.
Reverse the above procedure.

XP3111-10, 2/87

10.50

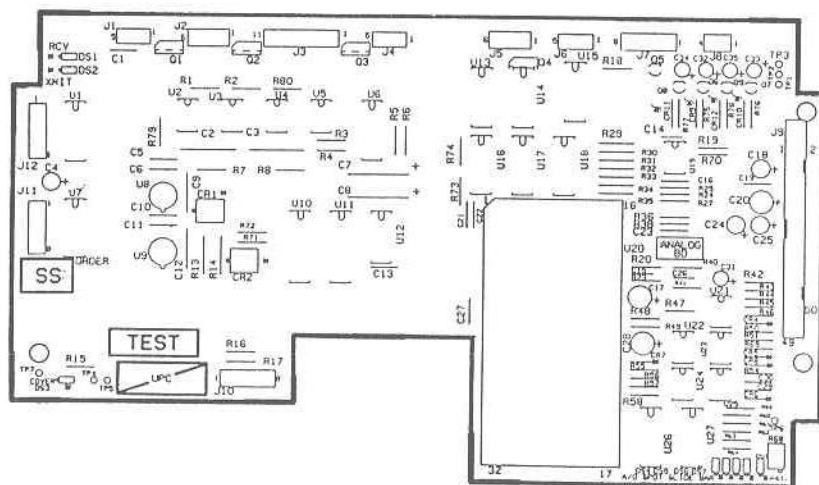


Figure 32 ANALOG BOARD without "PIGGY BACK" BOARD - 352391

XP3111-10, 2/87

Order by Part Number

10.51

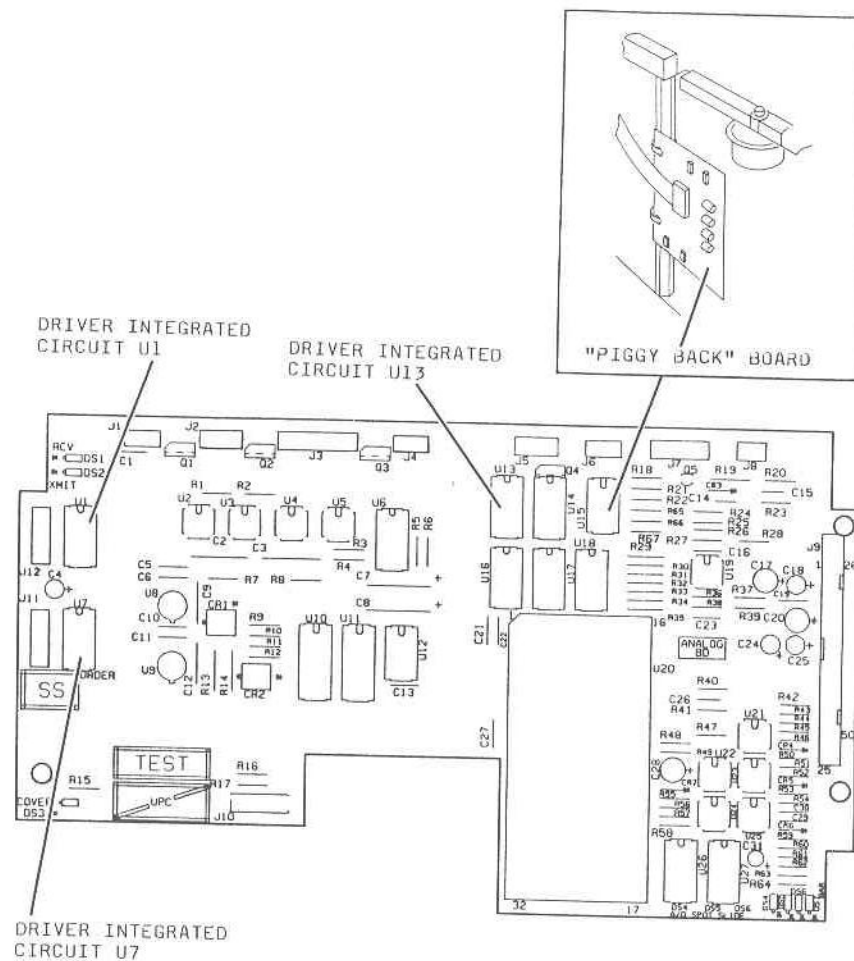


Figure 33 ANALOG BOARD with "PIGGY BACK" BOARD - 351461

XP3111-10, 2/87

Order by Part Number

10.52

Description		Part No.
ANALOG BOARD - 351461		
INTEGRATED CIRCUIT U1, U7, U13		337444

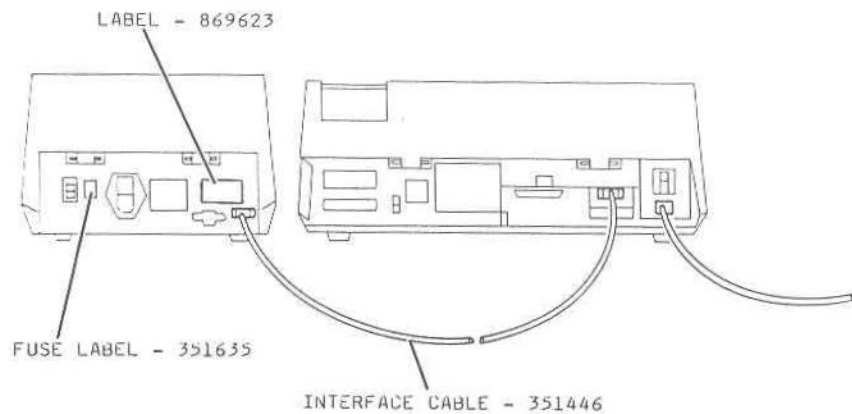


Figure 34

XP3111-10, 2/87

Order by Part Number

10.53

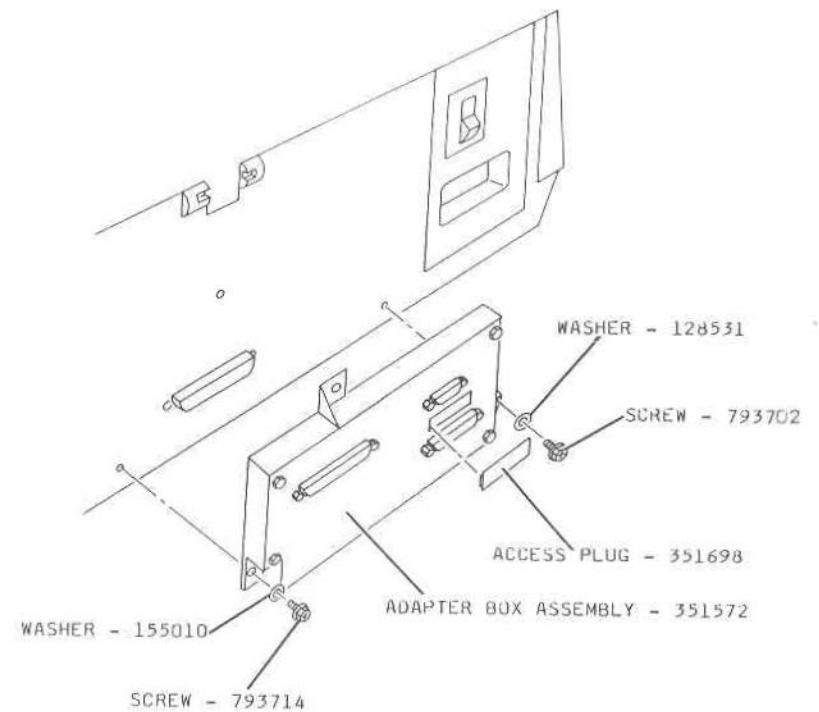
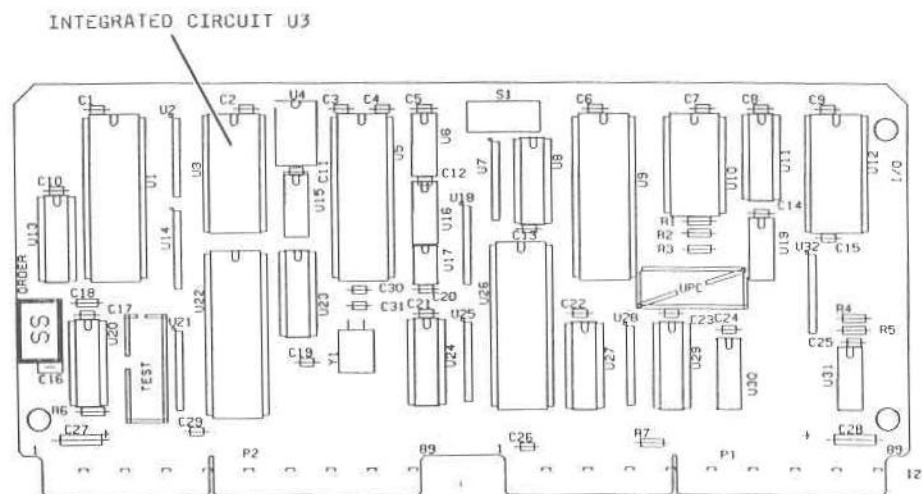


Figure 35 DT60 ANALYZER

XP3111-10, 2/87

Order by Part Number

10.54



I/O BOARD - 352520*	
Description	Part No.
INTEGRATED CIRCUIT U3	337353

* Version 10.7 software.

Figure 38 I/O BOARD - 352520*

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Order by Part Number

10.57

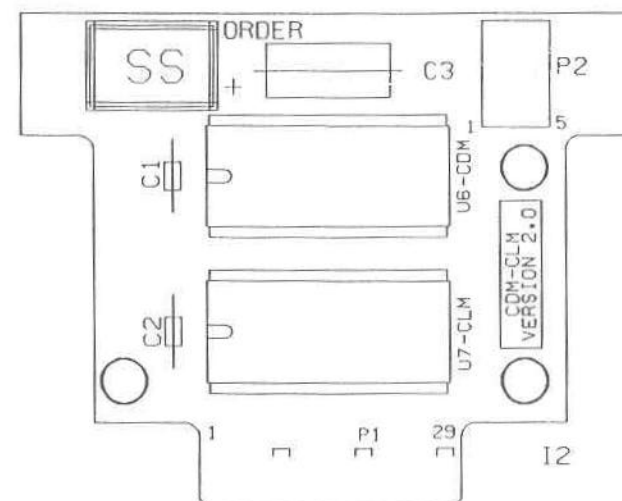


Figure 39 CDM/CLM BOARD - 351445

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Order by Part Number

10.58

034735 — 351635

Part No.	Description	Figure No.
034735	Screw - Tap, PHILLIPS, flat head, No. 4 x 3/8.....	31
096008	Washer - Plain, 0.130 ID x 0.375 OD x 0.030 Th.....	17,18
122706	Screw - Mach, PHILLIPS, pan head, 8-32 UNC-2A x 3/8.....	20
122714	Screw - Mach, PHILLIPS, pan head, 8-32 UNC-2A x 1/2.....	30
128531	Washer - Plain, 0.125 ID x 0.250 OD x 0.022 Th.....	35
131075	Ring - Retaining.....	17-19
144649	Nut.....	10,14
152776	Fuse - 3/4 A, 250 V, 3 AG.....	31
155010	Washer - Plain, 0.188 ID x 0.375 OD x 0.049 Th.....	23,24,35
173597	Screw.....	26b
182288	O-Ring.....	12
337353	Integrated Circuit - Usart.....	38
337379	Lamp - Flash.....	21,22
337396	Fuse - 1.5A, 125 V.....	22
337426	Switch - Main Power.....	27,28,31
337427	Cliplite.....	15
337429	Housing - ac/EMI Filter.....	27,28,31
337444	Integrated Circuit.....	33
337468	Fuse - 3/8 A, 250 V, 3 AG.....	31
337488	Fuse - 2.5 A.....	29
337490	Fuse - 250 mA.....	29
351441	Cam - Slider.....	16

Figure 40

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Order by Part Number

10.59

Part No.	Description	Figure No.
351445	CDM/CLM Board.....	36,39
351446	Cable - Interface.....	34
351449	Cable - Jumper.....	36
351458	Cover - Flash Lamp.....	21
351461	Analog Board - with "Piggy Back" Board.....	24,25,33
351463	Bar Code Reader Board.....	14
351464	Hall-Effect Sensor Board.....	20
351474	Belt - Slide Transport.....	17,23
351484	Pulley - Idler.....	17
351485	Plate - Flash Lamp Cover.....	20,21
351491	Fan Assembly.....	27,30
351492	Spot Detector Assembly.....	14,15
351498	Transformer Assembly.....	27,28
351503	Clip - Spring.....	10
351513	Main Cover Assembly.....	9,11
351515	Label - Track.....	23
351571	Flash Assembly.....	21,22
351572	Adapter Box Assembly.....	35
351579	Cup - Disposal.....	9,11
351596	Wire - Ground.....	28
351597	Wires - ED, Main Power Switch.....	28
351635	Label - Fuse.....	34

Figure 41

XP3111-10, 2/87

Order by Part Number

10.60

351646 — 869623

Part No.	Description	Figure No.
351646	Label - Warning.....	16
351649	Filter Wheel Enclosure Assembly.....	25
351650	Stop - Slide.....	14
351655	Washer Connector.....	31
351656	Connector Plate - Serial Interface.....	31
351665	Bracket - Sensor.....	14
351674	Screw.....	13
351678	Read Arm and Heater Assembly.....	12,16
351679	Preheat Arm and Heater Assembly.....	12,16
351680	Locator - Pipette.....	9,13
351684	Spring.....	10
351698	Plug - Access.....	35
351707	Gear.....	18,19
351711	Cap.....	19
351715	Reflectometer Assembly.....	24,26a
351717	Heater Platen Assembly.....	26a,26b
351720	Clip - Slide Transport.....	19
351722	Cover - Heater Arm.....	16
351744	Baffle - Slide.....	11
351761	Prom.....	29
351776	Foam - Adhesive.....	26a
352391	Analog Board - without "Piggy Back" Board.....	24,25,32

Figure 42

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Order by Part Number

10.61

Part No.	Description	Figure No.
352447	Tip Seat - Pipette.....	13
352498	Controller Board - without PROMS.....	27,29
352520	I/O Board.....	36,38
352616	CPU Board.....	36,37
352666	Motor Pinion Assembly.....	18,19
352667	Track Subassembly.....	21,23
426583	Catch - Magnetic.....	10
485834	LED - Green.....	15
498295	Cord - Power.....	31
613860	Mount - Rubber.....	11
642168	Filter - Ground glass.....	26a
658798	Screw - Mach, PHILLIPS, hex head, 6-32 UNC-2A x 1 1/4.....	18,19
793700	Screw - Mach, PHILLIPS, hex hd/washer, 4-40 UNC-2A x 1/4.....	18,19,27
793702	Screw - Mach, PHILLIPS, hex hd/washer, 4-40 UNC-2A x 3/8.....	14,15,17,35
793714	Screw - Mach, PHILLIPS, hex hd/washer, 8-32 UNC-2A x 3/8.....	10,17,22-25,35
793715	Screw - Mach, PHILLIPS, hex hd/washer, 8-32 UNC-2A x 1/2.....	22
793735	Screw - Tap, PHILLIPS, hex hd/washer, No. 8 x 3/8.....	14,25,26a,28
793736	Screw - Tap, PHILLIPS, hex hd/washer, No. 8 x 1/2.....	11
794231	Screw - Tap, PHILLIPS, hex hd/washer, No. 10 x 5/8.....	30
794888	Washer - Curved.....	18,19
850795	Screw.....	20
851825	Screw - Mach, PHILLIPS, pan head, 8-32 UNC-2A x 1 1/4.....	12
869623	Label - Modification.....	34

Figure 43

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Order by Part Number

10.62

Ada — Lab

Part No.	Description	Figure No.
351572	Adapter Box Assembly.....	35
351461	Analog Board - with "Piggy Back" Board.....	24,25,33
352391	Analog Board - without "Piggy Back" Board.....	24,25,32
351744	Baffle - Slide.....	11
351463	Bar Code Reader Board.....	14
351474	Belt - Slide Transport.....	17,23
351665	Bracket - Sensor.....	14
351445	CDM/CLM Board.....	36,39
351443	CPU Board.....	36,37
351446	Cable - Interface.....	34
351449	Cable - Jumper.....	36
351441	Cam - Slider.....	16
351711	Cap.....	19
426583	Catch - Magnetic.....	10
351720	Clip - Slide Transport.....	19,23
351503	Clip - Spring.....	10
337427	Cliplite.....	15
351656	Connector Plate - Serial Interface.....	31
352498	Controller Board - without PROMS.....	27,29
498295	Cord - Power.....	30
351458	Cover - Flash Lamp.....	20
351722	Cover - Heater Arm.....	16

Figure 44

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Order by Part Number

10.63

Part No.	Description	Figure No.
351687	Cover - Operator Access.....	9,10
351579	Cup - Disposal.....	9,11
351491	Fan Assembly.....	27,30
642168	Filter - Ground glass.....	26a
351649	Filter Wheel Enclosure Assembly.....	25
351571	Flash Assembly.....	22
351776	Foam - Adhesive.....	26a
351396	Fuse - 1.5 A, 125 V.....	22
337488	Fuse - 2.5 A.....	29
337490	Fuse - 250 mA.....	29
152776	Fuse - 3/4 A, 250 V, 3 AG.....	31
337468	Fuse - 3/8 A, 250 V, 3 AG.....	31
351707	Gear.....	18,19
351464	Hall-Effect Sensor Board.....	20
351717	Heater Platen Assembly.....	26a,26b
337429	Housing - ac/EMI Filter.....	27,28,31
351444	I/O Board.....	36,38
337353	Integrated Circuit - Usart.....	38
337444	Integrated Circuit.....	33
495834	LED - Green.....	15
351646	Label - Caution.....	16
351635	Label - Fuse.....	34

Figure 45

XP3111-10, 2/87

Order by Part Number

10.64



Publication No. XP3100-33

5/87

Supplement to PK3111

Technical Resource Publication

for the

Kodak Ektachem DT System

Version 11.0 Software

Introducing Version 11.0 Software

Version 11.0 is a new software package that is being installed on new *Kodak Ektachem DT60* Analyzers and *Kodak Ektachem DTSC* Modules. This information package includes technical information that you can refer to until the service publications are revised.

Compatible Hardware and Software

- Existing equipment will not be retrofitted with V11.0, so no modification kit will be provided.
- CDM No. 14 and above will be compatible with V11.0, as well as with V9.0 and V10.7.
- Currently, V10.7 software is installed at customer sites with *DTSC* Modules. To minimize impact in the field, V10.7 and V11.0 *DT60* Analyzers and *DTSC* Modules will be completely compatible and interchangeable with one another. This means that a *DT60* Analyzer can have either V10.7 or V11.0, and be compatible with a *DTSC* Module with either version of software. Version 9.0 software will continue to exist on those customer sites without a *DTSC* Module, and it will be fully supported in Parts Services, in the service publications, and in the customer support center (TAC/Hotline). V9.0 software is not compatible with the *DTSC* Module.
- V9.0 CPU Boards (CPU 1) will continue to be stocked at Parts Services as usual. V10.7 CPU Boards (CPU 2) will continue to be shipped from Parts Services until depletion of stock. Then all orders for CPU Boards will be automatically filled as V11.0, CPU 2. It is crucial that the only time you install a V11.0 CPU is in the event of a legitimate CPU failure. It will not be necessary to replace the Controller Board PROM in the *DTSC* Module at the time of a CPU Board replacement. Replacement of a CPU Board for any other reason will result in a short supply of the boards in Parts Services, and excessive repair costs being charged to your accounts. To minimize any special handling for the changeover, CPU Boards will not be frozen in stock as long as we don't see a sudden increase in board usage. Your cooperation is vital.

New Features

The following is a list of the features that become effective in V11.0. The list indicates if the new feature is included in a V11.0 *DT60* Analyzer or a V11.0 *DTSC* Module.

<u>Included In</u>	<u>New Features</u>
V11.0 <i>DT60</i> Analyzer	Slide spotting validation for potentiometric slides. After the pipette button has been pressed, an analysis is made of the slide to ensure that it has been spotted. Error code E14 reports if no drops, or very small drops, are detected in either half of the slide web. E14 will also be reported in the event that there is inadequate contact between the Electrometer Contacts and the slide electrodes. In the service mode, E14 remains the same as in the current software versions.
V11.0 <i>DT60</i> Analyzer	The diagnostic software for thermal errors in the <i>Kodak Ektachem DTE</i> Module has been revised. This may reduce unjustified occurrences of error code H15, a problem that occurs relatively infrequently.

<u>Included In</u>	<u>New Features</u>
V11.0 DT60 Analyzer	The CDM will have a checksum for the first time. If a checksum error is detected in the CDM, error code D13 will be displayed, and the message "ERROR IN PROM M" will be printed.
V11.0 DT60 Analyzer	A new correction factor and DR procedure will be available. Option 29 is a new option that does everything necessary to change reflectances, update correction factors, and run the DR procedure. All of the old options are still available, so the FE can choose to use the old or the new procedure. More information on option 29 is included in Attachment 1, on page 4.
V11.0 DT60 Analyzer	Option 43 has been revised, so that reference values and offset values for the DTE Module are now valid. New specifications will be developed. It is recommended that you continue to get reference and offset values by running slides and using the A/D counts and the specifications published in the Technical Newsletter, article no. 140.
V11.0 DT60 Analyzer	The warm-up time following an error for an open Pipette Locator Cover has been changed. If the Pipette Locator Cover has been open for more than 5 seconds, a variable warm-up time is used, based on how long the Cover was open. In some cases this will shorten the wait until the "ANALYZER READY" message appears, and in other cases the wait will be longer in order to restabilize the Incubator temperature. Option 70 should <u>never</u> be entered to override temperature monitoring when patient samples are being run.
V11.0 DT60 Analyzer	Na ⁺ and K ⁺ will incubate for 90 seconds if ETRF reference fluid is being used. This change is for <u>IPO markets only</u> at this time. A special CDM is necessary for this change.
V11.0 DT60 Analyzer	Post-prediction adjustment for NH ₃ and creatinine has been revised. Post-prediction values can now be entered for these chemistries. This change only affects the very few customers who require this feature. The CCS, and Hotline/TAC should be contacted if this feature is required.
V11.0 DT60 Analyzer	The Bar Code Sensor is disabled after a slide is inserted and waiting to be spotted. This change was made in order to be compatible with the new bar code circuit on the forthcoming "Single Board" configuration of the DT60 Analyzer. No benefits will be seen on the current "Multi-Board" configuration unit.
V11.0 DT60 Analyzer	When in extended service mode, the flashing "S" will no longer appear on the LC Display.

Included In	New Features
V11.0 <i>DT60</i> Analyzer (<i>DTSC</i> Module can be V10.7 or V11.0)	Rate chemistry calibration parameters can now be manually input. This enables a "user calibration" for rate chemistries. Option 32, keys 6 and 7 have been designated as "density limit 1" and "density limit 3", respectively. Printouts of the five calibration parameters for each chemistry will be made during a "wet" calibration, and by using the "print" key during option 32. It becomes extremely important to have the customer save these printouts of calibration parameters so that they may be reentered in the event of a CPU or memory failure. This will avoid having to do an unscheduled "wet" calibration.
V11.0 <i>DT60</i> Analyzer (<i>DTSC</i> Module can be V10.7 or V11.0)	A new "spike error" check in the diagnostic software allows two spike errors to occur during a rate test as long as the second spike is not the last reading before error code L14 is reported. In V10.7, only one spike error was required for an L14 error. A reduced occurrence of error code L14 is expected.
V11.0 <i>DTSC</i> Module (<i>DT60</i> Analyzer can be V10.7 or V11.0)	Memory storage error codes will now be reported. In V10.7, when a RAM or PROM checksum fails, the <i>DTSC</i> Module stops during initialization, but no error code is reported, because the error message is sent from the <i>DTSC</i> Module before the communications link is established with the <i>DT60</i> Analyzer. In V11.0, error codes D25 to D28 will be reported when memory malfunctions are detected. A D16 error code will now also indicate a possible loss of correction factors in the <i>DTSC</i> Module, as well as in the <i>DT60</i> Analyzer.
V11.0 <i>DT60</i> Analyzer (<i>DTSC</i> Module can be V10.7 or V11.0)	Option 52 now prints all four temperatures from the <i>DTSC</i> Module. The temperatures are not labelled on the printout, but are reported in the following order: 1) Read Platen, 2) Read Arm, 3) Preheat Platen, 4) Preheat Arm. The acceptable operating ranges are: <p style="margin-left: 40px;">Read Platen: 36.75 to 37.35° C Read Arm: 37.25 to 37.75 ° C Preheat Platen: 36.75 to 37.25 ° C Preheat Arm: 37.25 to 37.75 ° C</p>
V11.0 <i>DTSC</i> Module (<i>DT60</i> Analyzer can be V10.7 or V11.0)	The diagnostic software for thermal error codes for the <i>DTSC</i> Module, H16 to H19, has been improved. This should reduce the frequency of these error codes.

Attachment 1: Using Option 29

Option 29 is found only in V11.0 software. It provides two automatic procedures: a Correction Factors Procedure and a DR Procedure. When option 29 is executed, it automatically performs the functions of option 14, by providing A/D values for all readings. It also reduces the incubation time to 39 seconds, as if option 60 had been executed. When option 29 is completed, the A/D values are no longer reported, and an incubation time of 313 seconds is restored.

- The first message displayed is "SELECT LONG FORM". A "YES" selection provides mean and standard deviation in the results. If you select the DR check (in the next step), you should select "YES" here to obtain the mean and standard deviation of the DR values. If you do not select the DR procedure, you should select "NO" for "SELECT LONG FORM" because the values obtained will be meaningless for field use.

Press the chemistry select key to display "YES" or "NO" on the LC DISPLAY. If you want the long form, press the enter key when "YES" is displayed.

- The next message is "SELECT DR CHECK". Again, press the chemistry select key to display "YES" or "NO", and press enter for the alternative you want. If you select "YES" you cannot update reflectance values, and you will be doing the DR procedure and obtain DR results for each reading. If you select "NO" you can update reflectance values and will be running the Correction Factors Update Procedure. No DR results will be reported.
- The next message is "ENTER #REPS (1-10)". The number of readings is displayed on the second line. To select the number of readings, press the clear key, and then enter the number of readings you want. We are recommending a selection of 3 readings.

- If no DR check was previously selected, the next message is "PRINTING REFERENCE VALUES". A printout is made of the existing black and white correction factors and reflectances, for all 3 LEDs. Refer to the printout to see if you need to change any of the reflectances because your Reference Tool Slide box values are different from the values currently in memory. You cannot manually change these correction factors using option 29. You should use option 81 to manually input correction factors following a CPU or memory failure if a record of the correction factors is available.

```

*****
REFERENCE VALUES
*****
CORRECTION FACTORS

RED(660NM)/B  -.017
RED(660NM)/W   .8945
GRN(555NM)/B  -.012
GRN(555NM)/W   .8212
YEL(605NM)/B  -.011
YEL(605NM)/W   .8811

SLIDE REFLECTANCES
GRN(555NM)/W   .8146
YEL(605NM)/W   .8093
RED(660nm)/W   .7985
GRN(555NM)/B   .0415
YEL(605NM)/B   .0383
RED(660nm)/B   .0353

```

After the printout is completed, the message "CHECK REFERENCE VALUES / CHOOSE VALUE (SELECT TO END)" is displayed. Now you can change slide reflectances if necessary. First, press the following number to retrieve the reflectance value:

<u>Press:</u>	<u>To Access:</u>
1	White reflectance, green LED
2	White reflectance, yellow LED
3	White reflectance, red LED
4	Black reflectance, green LED
5	Black reflectance, yellow LED
6	Black reflectance, red LED

After you have selected a value, you can press the clear key to delete it. Then you can enter a new value. Be sure you enter the decimal point in the correct position. Press another number if further changes are required.

Press the chemistry select key when all values are correct, and you are ready to continue.

- The next message is "INSERT STANDARDS SLIDE". This refers to the WHITE or BLACK REFERENCE SLIDE. Insert one of these tool slides. **You must use the slides for the DT60 Analyzer, not the DTSC Module.**
- Because the REFERENCE SLIDES have no bar codes, the system cannot identify them. Now you must manually identify the reference slide you inserted. The next message will be "SLIDE NOT IDENTIFIED / SELECT TEST". Press the chemistry select key to display "WRDT", for the white reference slide, or "BRDT", for the black reference slide. Press enter when the correct identification is displayed.

- Now the system is ready to take the readings you selected. Readings for all 3 LED's will be taken automatically. It will take approximately 2 minutes to process each set of the readings. (For example, if you selected 3 readings, you must wait approximately 6 minutes.) The message "WAIT UNTIL SLIDE PROCESSED" is displayed. You will hear the Racks moving as the internal White Reference is moved for reference readings.
- The results of the first tests are printed, for each LED. The following printouts indicate the various possible selections:

```

*****
RED(660NM)/W
RD RATIO .7947
.0983 DR
G(DR) = 0
A/D = 3052
REF = 3860
OFST = 11

RD RATIO .7945
.0994 DR
G(DR) = 0
A/D = 3052
REF = 3871
OFST = 9

RD RATIO .7945
.0995 DR
G(DR) = 0
A/D = 3052
REF = 3871
OFST = 10

-----MEAN-----
.09905

--- STD. DEV. ---
.0006944
*****

```

DR Procedure:
 "SELECT LONG FORM" - "YES"
 "SELECT DR" - "YES"

```

*****
RED(660NM)/W
RD RATIO .7947
A/D = 3052
REF = 3860
OFST = 11

RD RATIO .7945
A/D = 3052
REF = 3871
OFST = 9

RD RATIO .7945
A/D = 3052
REF = 3871
OFST = 10

```

Correction Factors Procedure:
 "SELECT LONG FORM" - "NO"
 "SELECT DR" - "NO"

The "RD RATIO" result on the printout = $\frac{\text{slide reading}}{\text{internal WHITE REFERENCE reading}}$

If you previously selected "YES" for "DR CHECK", the printout will also include values for "DR" and "G(DR)". "DR" is a reading that will be used for the mean DR value. "G(DR)" is a spline value and will always be zero because no chemistry is being run.

The "A/D" result on the printout is the slide reading with no calculations.

The "REF" result is the A/D reading from the internal WHITE REFERENCE, on the LOWER RACK.

The "OFST" result is the A/D reading when all LEDS are off. This indicates the electrical "noise level" within the FORS ASSEMBLY.

If you previously selected "LONG FORM" and more than 1 reading, the mean and standard deviation are also printed.

- The "INSERT STANDARDS SLIDE" message is displayed again. Now insert the other tool slide, indicate if it is a white or black slide, and wait for the results to be printed.
- The "INSERT STANDARDS SLIDE" message is displayed for a third time, but **do not insert a tool slide again**. Press the cal mode key.
- If you previously chose the Correction Factors Procedure, the message "CALCULATING CORRECTION" is displayed. If you indicated by your earlier choice that this is a DR Procedure, then examine the printout for the mean DR value that is given for each LED color and compare to the box value as described in the CES DR Procedure.

```

*****
NEW
CORRECTION FACTORS
RED(660NM)/B   -.016
RED(660NM)/W   .8616
*****

```

- If you are doing the Correction Factors Procedure, the message "UPDATE CORRECTION FACTOR?" is displayed, with the "YES" response. If you want to enter the new correction factor on the printout into the system, press the enter key. If you do not want to enter the new correction factor, press the chemistry select key to display "NO", and then press enter. This dialog is repeated for each of the remaining LED colors until all processing is complete and the LC Display indicates "ENTER OPTION NO."

Using Option 29 to do the Correction Factors Procedure

The specifications for the correction factors procedure have not changed, but option 29 makes it easier to access the necessary values. Use the following as a guide:

- Select "YES" for "SELECT LONG FORM".
- Select "NO" for "SELECT DR TEST".
- Select 3 readings.
- When the printout of existing correction factors and slide reflectances is made, compare the reflectances with the values on the box of reference slides. Enter new values if necessary.
- Run the Reference Tool Slides.

Using Option 29 to do the DR Procedure

The specifications for the DR procedure also have not changed, but you can use option 29 to make the procedure easier to do:

- Select "YES" for "SELECT LONG FORM".
- Select "YES" for "SELECT DR TEST".
- Select 3 readings.
- When the printout of the readings are made, compare the mean DR values on the printout with the values on the label of the reference slide boxes. For white readings, the results should be within $\pm .05$ of the value on the label. For black readings, the results should be within $\pm .025$ of the values on the label.

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